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Cooperation in Urban Water Management

Conference Proceedings

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COOPERATION IN URBAN WATER MANAGEMENT

Report of a conference conducted by
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Engineering and Technical Systems of
the National Research Council

NATIONAL ACADEMY PRESS
Washington, D.C. 1983

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PREFACE

There is a growing awareness among water supply engineers that the urban areas of this nation are faced with a crisis in water supplies stemming from long-standing problems in the management of municipal water utilities, as well as from outdated and decaying infrastructures. Unfortunately, this awareness does not seem to be shared or given high priority relative to other urban problems by public policy planners and decision makers at local and regional levels of government. The public sees signs in the media regarding drought or deteriorating infrastructure and often encounters temporary personal experiences hinting at a pending crisis. Yet there is insufficient appreciation of the magnitude of the coming problem and the lead time required for preventative and remedial actions.

Alternative solutions to avert severe future water supply shortages in the nation's principal municipalities appear to be costly, time consuming, and complicated in terms of the institutional arrangements necessary for managing the inevitable inconveniences. Politicians are reluctant to face these difficulties because of the hard decisions that must be made and the burdens that they must place upon voters.

Although most water supply professionals believe that much technology either exists or is forthcoming for addressing urban water supply problems, there are research and development needs that must be detailed and pursued, especially regarding renovation of distribution systems. However, a larger problem appears to be improved professional practice and technology transfer of recent research to the levels of government ultimately responsible for decision making and implementation.

Water supply engineers typically are not involved directly in government and public policy decisions. They sense a large communication gap between themselves and those who govern large cities and make decisions affecting the future of water supplies. This barrier to effective application of engineering technology to solving existing water problems and averting future ones must be overcome by an initiative that confronts it head-on, researches its causes, explores its dimensions, and proposes remedies.

The National Research Council, through its Water Science and Technology Board, held a one and a half day conference, October 14-15, 1982, to assess the barriers to efficient management of urban water supplies, titled "Cooperation in Urban Water Management."

A steering committee selected 30 invitees to the conference to present short "talking papers" and participate in general discussions that would explore and propose means for overcoming obstacles envisioned by water supply engineers that prevent or assign low priority to solutions to crises in municipal water supplies. The primary objective of the conference was to decide if a broader and more intense study by the National Research Council is warranted. A secondary objective was to provide guidance on the state of research needs, development, and technology transfer needs regarding municipal water supplies.

The speakers' presentations and a summary of the general discussion are presented in these proceedings. The conference was supported by the National Science Foundation (NSF), the Environmental Protection Agency (EPA), and the American Water Works Association (AWWA) Research Foundation.

The Water Science and Technology Board members acknowledge, with gratitude, the contributions of the speakers, the steering committee members, the NRC staff members, and the sponsoring agencies to the success of the conference.

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MORNING SESSION
October 14, 1982

Biography

DAVID H. MARKS

DAVID H. MARKS, chairman of the steering committee, is associate director of the Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics at MIT and professor of civil engineering. He is the developer of the MIT River Basin Simulation Model (MITSIM), used throughout the world for feasibility and economic evaluations. As leader of the MIT Water Resources Group, he has worked on projects in Egypt, Yugoslavia, Greece, Colombia, and Argentina. He is consultant to the continuous assessment process of the U.S. Water Resources Council Plan of Study for the Lower Colorado River Basin and to the Delaware River Basin Commission, and has worked on drought management in the San Francisco Bay Area. He has served on a number of NRC panels and committees, including the Committee to Review the Potomac Estuary Experimental Water Treatment Plant Project, and is a member of the American Society of Civil Engineers. He holds a Ph.D. in geography and environmental engineering from Johns Hopkins University, and is author of a number of books and articles in his field.

INTRODUCTION

David H. Marks
Chairman
Steering Committee on Cooperation
in Urban Water Management

The recent explosion of concern for America in Ruins in the popular press is beginning to bring to the public eye a set of concerns long felt by the water professional. We have argued that adequate attention has not always been paid to the maintenance, repair, and rehabilitation of existing facilities; that existing institutions do not always have the structure, ability, or knowledge of technology options to best manage urban water; and that new demands for expansion and higher quality would further increase stress on available resources. However, increased public concern can be a mixed blessing, for it can bring with it a "quick fix" mentality that in the search for solutions could miss important opportunities for reexamining priorities, introducing new technology, and strengthening water institutions. Most of the studies upon which predictions of the imminent collapse of our urban infrastructure are predicated have been superficial and based on questionable assumptions (all old systems need to be replaced with the same type of technology, the public will find a doubling of existing water rates unacceptable, etc.). In short, they are informal financial agreements, with little feeling for the richness of technical and management options available to address the problem. In fact, many professionals feel that the appropriate technology exists for major strides in system renewal but that institutional and/or communications barriers block their inception. The purpose of this conference is to bring together a diverse set of water "thinkers" and "doers" in disciplines ranging from technology to finance to consider a set of questions about mechanisms for cooperation and in water management toward better sharing of costs, knowledge, and resources. It is hoped that by the end of the sessions we will have considered the following questions: Are there significant barriers to cooperation in water supply? Are they different for different sizes and classes of systems? What are examples of functions where cooperation and new technology have been helpful? What institutional and financial mechanisms seem appropriate for further consideration?

The conference will start with a discussion of some generic comments on demand, technology, financing, and institutions by the more academic of our participants to set the stage for a day of discussions that will be led by those who must provide and regulate urban water supply and those at a level of local and regional government who must put expenditures for water in the context for other services (educational, health, transportation, etc.)

An outcome of this meeting will, we hope, be a first guide to the art of the possible as well as an agenda for further research, investigation, and action. We thank you all ahead of time for the effort and perspective you have brought to the planning of this conference as well as your help in bringing order to a difficult problem.

Biography

WARREN J. WICKER

WARREN J. WICKER is professor of public law and government and assistant director of the Institute of Government at the University of North Carolina, Chapel Hill. He has been a consultant to legislative committees and special study committees on water-related matters and local government finance and organization, as well as to numerous multi-unit water and wastewater projects. His areas of speciality include organization and financing for water and wastewater services, interlocal cooperation, city-county consolidation, and local government administration and finance. He has an M.A. from the University of North Carolina.

INSTITUTIONAL PERSPECTIVE

Warren J. Wicker
Institute of Government
University of North Carolina,
Chapel Hill, North Carolina

In considering public issues, there are two central questions: who decides and who pays. They are not unrelated. Sometimes, if we decide who decides in a process, we will have decided who pays, or if we start with deciding who pays, we may have decided who decides in that process.

I will try to pay most attention to the organization for decisions in considering the institutional aspects of urban water management and leave the financing to somebody else, although I have an interest in that, too. I will also talk mostly about governmental agencies and their organization, leaving the discussion of the private agencies to someone else as well. I will not cover regulatory matters. Others are going to touch on those.

First, one or two words about definitions. We will be using a number of terms that do not have very clear meanings. Even the first word in the title of my remarks, "institutional," is subject to confusion. I am inclined to agree with Maynard M. Hufschmidt, a former colleague at the University of North Carolina, who suggested several years ago that we should abandon the term as too general and vague. Nevertheless it is broad enough to cover anything I might say, so we will use it.

The second term that we ought to consider today is "urban." There is often much confusion in the use of "urban," "city," and "city government." Not everything that goes on in a city is the responsibility of the city government. We have very few local governments that are, in fact, coterminous with an urban area. In most cases, we have many different governments serving a single urban area, and only some of them are city governments.

A typical situation may be illustrated with a question. How many of you know who the mayor of Los Angeles is? Almost everybody in the room. How many of you can name the chairman of the Los Angeles County governing board? No hands, but I trust those from Los Angeles could do so.

Now, it so happens, if you exclude water and sewer outlays, that the county of Los Angeles spends more money inside the city of Los Angeles than does the Los Angeles city government. We sometimes think that the answer, if there is any problem concerning cities, is to send the mayors more money. That undoubtedly is a happy event for mayors, but it may not fit the organizational arrangements that we now have. City governments are not responsible for everything that goes on in cities--not even for all governmental activities.

"Regional" is another term with which we are concerned. I will use it today in two senses that I think are satisfactory for our purposes. First, a regional system is one that serves more than one political jurisdiction. That is a fairly simple definition and often appropriate. Perhaps a better one would be any system whose service area is determined primarily by supply constraints, service demands, and technological considerations rather than by political jurisdictions and tradition.

We may begin with the steering committee's finding that increased regionalization and cooperation in urban water management is needed. There are five classes of needs that may call for increased regionalization and cooperation in urban water management. First, the need to attain an appropriate jurisdiction for operations. Second, the need to replace aging facilities and systems. Third, the need to expand water supply sources. Fourth, the need to extend services to new areas, particularly urban fringe areas. Fifth, the need to improve the quality and reliability of services. (You will notice that I did not use "infrastructure." After reading Bill Safire's recent comments, maybe we ought to abandon that, too.)

With respect to water management in the United States, there are thousands of actors--the federal government, the states, counties, cities, townships, special districts, authorities, commissions, private organizations (for profit and nonprofit), and individuals. Responsibility is dispersed--more dispersed than is desirable even when full weight is given to the values of tradition, local initiative, control over a community's own destiny, and the strengths that may arise from diversity.

We have some 82,000 units of government in this country. Somewhat more than half of them are expressly authorized to provide water services, and probably 40 percent of them actually are involved in one way or another in providing water services. There are 400 cities in this country with a population of more than 50,000. In 75 of them the city government is not involved in providing water services. Of the 82 cities in California in that population category, 21 city governments do not provide their own water, suggesting that regionalization has probably developed in these areas.

The principal barriers to cooperation are matters of attitudes and tradition. Technological barriers are not important by definition--where cooperation and regionalization are technologically impracticable, they are not needed. Legal barriers to organizational cooperation or regionalization are present in a few places and for some purposes, but apparently are not very important nationally. In most states most public units may work out cooperative arrangements, merge agencies, or transfer responsibilities to units with larger jurisdictions.

The multitude of public agencies involved in delivering urban water services makes cooperation difficult simply because of the numbers.

Each party has its own perspective and must be primarily concerned with its own interests.

We have great diversity, and great pride in that diversity and in the independence that grows out of it, and that is one of the major problems we face.

Independence is prized. Furthermore, some regional cooperative activities will not improve the "bottom line" for every unit, especially when "nonutility" benefits are an important basis for a regional approach.

I have suggested that the barriers are chiefly attitudes and traditions. I wish I had a solution to offer, but you will find that I do not. Bringing a large number of units together is a problem. Then there is change itself. Your chairman suggested that this is a problem and that the timing of a change is critical.

A friend in the Agriculture Extension Service told a story several years ago of a farmer who was visited by a young agricultural agent whose purpose was to instruct the farmer in better farming practices. In response, the farmer said, "Young man, you might as well go away. I already don't farm half as well as I know how." Something of that same situation exists with respect to cooperation and regionalization in urban water management.

We need to recall that water is not just water. As one who speaks from an academic position and is not a utility manager, I am able to see that truth! Water serves many purposes. Atlanta's water department has a slogan that "Where water goes, Atlanta grows." (There is an interesting sidelight on this slogan. I suggested to a friend recently that he write to the water chief in Atlanta and ask about the basis for the slogan, if they had done any studies showing the influence of waterline extensions on urban growth. The response was a letter from the chief engineer saying that a search of their files produced no report on such a study. At the bottom of the letter was the slogan. Some things don't have to be researched!)

Another problem is the we-they attitude that is pervasive in our system. Where one sits determines where one stands, and also the view that one takes toward those in the courthouse, the statehouse, the federal department, the city down the road, or whatever the other agency is. Water utility managers (and some of these are my best friends) also are inclined sometimes to take a very narrow, utility view. It is obvious, as the Atlanta slogan affirms, that water is not just water. It is central to the whole development of the urban area.

I can illustrate this relationship with the municipal annexation experience in Greensboro, North Carolina. In 1957, Greensboro annexed some 10 square miles, and at that time about 15 percent of the people in the area were already served by city water. Service had been previously extended outside the city's boundary.

In 1959, North Carolina adopted a new annexation policy that permits cities to annex areas that are urbanly developed by action of the city council alone. There are procedures to be followed, but the people do not vote. Before enactment of this new annexation procedure, city officials were cautious in extending services to the developing surrounding areas because they were uncertain that their boundaries might later be extended to match the service area.

Greensboro is currently undergoing another annexation of about 15,000 people and about the same amount of area. Eighty-five percent of those in the area are already served by city water--extended to the outside before annexation. A change in the annexation law led to a change in water extension policy. The new annexation law permits the city to tie together the planning for water extensions with the future growth and the expansion of all city services to the growing urban area. If the city were in a position of not ever being able to expand its boundaries, or of not definitely knowing that it would, the planning for water utilities might have been quite different.

Urban water managers need hard information about the benefits of cooperation to the larger urban area if cooperation in urban water management is to be encouraged. Promoters and managers need to understand the role of water in the development of urban areas. While service to the existing jurisdiction must remain primary in the manager's view, he must also understand the needs of the larger urban community.

Those who supply the information need to appreciate that the character of the needs varies from place to place, and thus cooperative arrangements must be tailored for each area.

How do we promote cooperation and regionalization? There is no simple answer. We need to recognize that situations vary from state to state, that the problems in each are different, and that their traditions are different. What is needed is a package of cooperative organizational and financing arrangements, suitable to the circumstances and traditions in each state. Looking at success stories, as we will in this conference, should offer insights. It is also well to keep in mind that most of us are in the business of government, not in the government of a business. And water managers, like other executives, ought to be concerned not only with solving problems but also with seeking opportunities.

Given the environment in which we work the most promising organizational approaches are those I suggested in the talking paper prepared for this conference. First is interlocal cooperation. This is the approach that requires the least change and can often be quite effective. County government as a regional water agency is second. The county government is already on the scene. Counties in many parts of the country are increasingly becoming involved in providing water services. This is a good approach in many places. State governments are active in providing services in a few states. Where possible, this is an appropriate way to go. Finally, new regional agencies should also be considered. These can be the most effective approach, but also the most difficult to achieve. Thus, they are likely to be developed in only a few urban regions. Where it is feasible, fine, but I would be inclined not to waste a lot of time with the attempt.

Success in selecting the most appropriate approach requires that we understand the area's demands and constraints and have the leadership to carry through with the selected approach.

There is a story that illustrates the first point. It is about the lady who on a cold winter day was walking down the north side of a street and passed a pet shop. The sun was shining in the corner of the pet show window, and five little puppies were huddled together in that corner. She was very touched by this scene. She went inside and commented on it to the pet shop owner, how beautiful it was to see those little puppies huddled together to keep each other warm. The pet shop owner, wise in the ways of puppies, responded, "No, lady, they are not huddled together to keep each other warm, each is huddled against the others to keep himself warm."

Perhaps we can promote cooperation and regionalization in urban water management if we can create conditions in which each of us "gets warm" by cooperating or merging!

Bob McGarry mentions in his talking paper the importance of having people who provide leadership. Two instances from my consulting experience illustrate the role of leadership.

After several years of negotiating between officials in Asheville and Buncombe County, North Carolina, a member of one of the boards concluded that cooperation was more important than a principle involving a quarter of a million dollars a year. An agreement was soon reached.

Another example of individual leadership resulted in the regional water agreement that now covers Winston-Salem and Forsyth County, North Carolina. I was asked to meet one night with two members of the county governing board. After 10 years of bitter fighting over water arrangements throughout that region, those two members had decided that the time had come to reach an agreement. They had concluded that it was necessary to compromise. "Draw us up a plan," they said, "that requires everybody to give up something. We are willing to give. We will even give more than the other units, if that is necessary." Their directions were followed and an agreement was soon reached.

That kind of leadership, that kind of appreciation for the full range of a region's needs and the place of water in meeting those needs, are what is required. I wish I could tell you how you get that kind of leadership--other than just luck--but I cannot. We can be pleased that such leadership often arises, but at the same time we feel distressed that it does not always do so. In any event, it may be comforting to remember that there is no organization that good people cannot overcome--in time, at least!

GENERAL DISCUSSION

DR. MARKS: In your discussion of promising approaches, you differentiate between interlocal cooperation and new regional agencies. Most of the uninitiated in the field, when they come in, always seem to suggest new regional agencies.

Now, admittedly, that causes a heck of a lot of problems, particularly when they are focused on a single problem and you try to set up different regional agencies for different problems that have different boundaries. You are quite willing to dismiss that as a problem.

On what do you base the fact that we are just never going to have these regional problem type organizations with their own constituencies and their own formal structures as opposed to loose confederations?

MR. WICKER: I didn't mean to dismiss them completely always and forever and in every place. I think there will be times and places where they can be created in conditions where there is a crisis or some portion of the needs of the total system is sufficiently great that you can bring together a complete merger, something like the English experience that Dan Okun has written about.

However, my observation around the country and experiences suggest that that is not likely to happen in very many places. That doesn't mean that it should be dismissed and should not be considered. But the amount of effort that goes into creating a totally merged situation is oftentimes, I suspect, not worth it if failure is going to be the result at the end, although sometimes an attempt at that results in making a step or two, that is, planning some phases of management of joint supplies, that sort of thing, may come out, if not a complete merger or a new organization. One should always strive for the ideal. It is a question of how much of the resources we should apply to striving and how much to accomplishment.

DR. MARKS: I think that is an important point, too, at least to inquire into because certainly the payoff with the regional agency is considerable. I wonder what you see as a trend, are we going up or down or horizontal or what?

MR. WICKER: Most of the actual movement nationwide has been in interlocal cooperation. Most of the states have something like the Advisory Committee on Intergovernmental Relations as a model of interlocal cooperation act, under which units may do together whatever they are authorized to do individually and separately. And so we have seen a great deal of activity on that front.

We have also seen the creation of some new agencies, as you mention, of course, all the way from the water agencies to city-county consolidation at the local levels. However, the total full mergers and total new large areawide agencies are relatively few. Now, when they do happen, they serve lots of people.

QUESTION: Mr. Wicker, I have got to ask, have you had an experience where the formation of regionalization becomes so much of a compromise that it is ineffective and will not accomplish its goals?

MR. WICKER: No. In this kind of intermediate or interlocal arrangement--for example, the Mecklenburg-Charlotte arrangement--there is a single body outside that makes most of the policy. The same thing is true of Forsythe and Winston-Salem. So these are both large urban areas that have come together.

In both cases the outside body that was created is for advisory and some operational control. Operations are centralized, and general policy making is largely centralized, although the governing boards have residual authority.

But you have got the results without merging everything or creating a new unit. Now, in part, they appointed people of such prominence in the community and such weight that the governing board members would have to listen to them. But they did that deliberately. That is facing the political realities of the local situation.

QUESTION: One of the problems is that local officials perceive regionalization as something that is lowered on them by a superior level of government. Many of our regionalization problems have been caused because we started the regionalization at the wrong end of the problem.

Regionalization works, and it is working in Kansas on a number of approaches to regional water system where you get the local officials together. And your "warm puppy" story is right on. They are really not worried about whether the rest of the puppies are warm, they are worried about whether they are warm.

DR. MARKS: Let me introduce our next speaker, George Peterson, with the preface that financial times are changing. We are finding in federal environmental quality funding that that funding is drying up, and at the same time we are beginning to hear a large outcry about the difficulty of financing these tremendous investments in water.

None of us are yearning for PL 92-500 for water. I hope their ardor isn't too great, because it won't happen. But nonetheless, we still have the issue of how it finances, once we have an organization, what appears to be a considerable investment and an investment that may have to be carried out by institutions that do exist.

Biography

GEORGE E. PETERSON

GEORGE E. PETERSON is principal research associate and director of the Public Finance Program of the Urban Institute. He has been a member of the Urban Institute since 1972, directing studies that include urban land development patterns, impacts of tax policy on urban development, urban capital investment and financing, and compensation programs, and has published books and articles on public finance. He holds an M.A. in politics, philosophy, and economics from Oxford University, where he was a Rhodes scholar, and a Ph.D. in economics from Harvard.

FINANCIAL CONSIDERATIONS

George E. Peterson
The Urban Institute
Washington, D.C.

Water system finances have been inserted in the right place in the agenda this morning--between institutional perspectives and maintenance and repair issues. In the practical world much of the momentum for institutional change over the next decade is going to come from financial considerations, and the demand for more efficient repair and maintenance strategies is going to be prompted by the financial constraints governments must live with.

I wanted to start with an idea of the scale of the financing problem. But instead of talking in the aggregate about national need studies, I want to look at the capital investment requirements of a particular city, then work back to the financing choices in carrying out that investment.

I am speaking of Cleveland. The city has an interesting history. It faces one of the nation's largest rebuilding tasks in repairing its water distribution system. It also suffered through a several year suit brought by the suburbs against the central city, which owns the water system and provides water services to the suburbs. The grounds for the suit were that the city had wasted a regional asset by failing to maintain and repair the water system.

After several years, a lower court did, in fact, rule in favor of the plaintiffs and order surrender of ownership of the water system by the city. The court ordered the creation of a substitute regional authority. It was only after that court order, with the case on appeal, that the parties got down to negotiation about the scale of capital reinvestment that would be necessary to maintain the water system. The formal agreement the parties signed places a close estimate on the scale of investment.

Specifically, in that settlement the city agrees to undertake some $800 million of catch-up capital investment, made necessary by deferrals over past decades. That requires roughly 17 times the rate of capital investment that had been carried out in the preceding decade. In just four and a half years, annual debt service on the new bonds to be issued would be greater than the entire revenues of the water system this past year.

The rate increases necessary are 15 percent starting last December, 25 percent this year, and 35 percent each year thereafter into the foreseeable future, so that by four years we will have had a rate increase of some 250 percent, with only a modest reduction in the rate of increase throughout the rest of the decade.

These are large numbers from a taxpayer's point of view, from the mayor's point of view, and from the general government's point of view. Cleveland admittedly is an extreme case, but the financing problem is on a similar scale elsewhere. Philadelphia, for example, is in the middle of a water system repair plan that will require almost 25 percent rate increases annually for five years.

Now, let me speak for a minute about the nature of budget competition between water and other claims on budgets. It happens both in the capital budget and in the operating budget.

In the capital budget, water reinvestment is competing with a backlog of repairs for streets, bridges, transit, jails, and school systems. And if you will look at those cities where priority rating systems for the capital budgets are employed, water frequently does not rank very high either in the financial manager's perspective or in the public's perspective.

I think it is instructive to ask why that is so. It is more difficult to assess water system condition and share that information with the public. Part of it is the lack of information we will be talking about. Part of it, I think, is the failure to express the element of risk that exists in a water system. An accumulation of small leakages manifests itself to the average citizen as an inconvenience. To a financial manager you can make the case that you will save money by repairing today rather than by repairing on a much larger scale tomorrow.

But the sense of large risk comparable to a bridge failure or transit breakdown is unclear. What is that risk? How do you measure the probability or seriousness of an occurrence? It seems to me that this is one of the particular problems that water managers must wrestle with. And it is perhaps best illustrated by the $6 billion or $7 billion proposal for the third water tunnel in New York City. The risk, everyone acknowledges, is almost impossible to specify. There is a risk that one of the existing tunnels will fail. There is risk in closing down the present tunnels for inspection--the risk is that the valves may rust shut and you cannot reopen the tunnel at all. So you cannot even gather information to help specify the risk. And in the absence of information, people are being asked to make the financial commitment for a $7 billion investment.

On the operating budget side, I think that the problems are most acute for cities that operate their systems as a division in the general government. Water systems, as you doubtless know, are convenient places to seize loose cash when budgets are under attack.

I will give a couple of illustrations: Buffalo is always paraded first in federal testimony as an area in need of federal assistance to make water system repairs. In fact, in the early 1970s, when the city's first major budget imbalance occurred, one of the first things the city council did was to pass legislation requiring the water authority to transfer $2.4 million a year to the general fund to close the budget gap. This eliminated almost completely maintenance and repair activity in the water system.

In Philadelphia, in the mid-1970s, when the city faced a budget crisis, the council simply passed a resolution saying that $20 million the water system had on hand for repair and future capital reinvestment were excess reserves. The money was then transferred to the general fund to close a 1975 operating budget deficit.

And some places have been more ingenious than this. In Cleveland, where there were strict regulations against transferring cash, short-term notes were issued. No one else would buy them, since the city was in such bad shape, but the city sold them to its own water authority and then defaulted on the notes.

Now, in the question of long-term financing of their capital backlogs, water systems are very fortunate, in the large. They have a good pricing mechanism. They are free from general tax limitations, from voter resistance to general obligation bonds, and from the necessity of going to the electorate for voter approval.

In terms of ability to compete with other infrastructure items by resources, they are in a good position. But lucky as you are in this revenue bond instrument, the ability to go to the financial markets with a revenue bond depends upon the financial market's confidence that rates will be raised in the future as appropriate to repay that indebtedness. And I am convinced that the major impetus in the short run for institutional change is going to come from financial system demands for institutional arrangements that will ensure the future ability to raise rates. There is a demand on the part of financial markets to depoliticize the rate-setting process for both water and sewer systems.

We already see some movement toward new institutional authority. In 1979 the city of Baltimore was faced with more than $600 million mandated capital backlog. It reorganized its water and sewer system to set up an independent board that would have rate-setting authority. It shortly will go to the market with its revenue bonds.

Boston, following an even more extreme example of that same tendency, spun off its sewer and water operations as an entirely independent authority. Again, the purpose was to be able to finance the city's capital investment backlog. The authority raised its sewer rates by 296 percent the first year it went independent and has greatly augmented investment levels.

There is immense pressure coming down from the financial markets and from the bond rating agencies to all these older cities, which still operate water systems as part of the general government activities, to insure the independence of the pricing responsibility.

Even more extreme financial changes are about to come. For these water distribution systems, the assets in the ground are one of the most valuable assets that the cities possess, and it is tempting, under financial pressure, to try to cash in on these assets. We have begun to see proposals to sell water systems--sell them either to a regional authority or to a newly established authority. I cite in the talking paper some examples of parallel things that have been done in sewer systems. Proposals are floated from time to time in New York to create a regional authority that would take over the water system's debt and provide between $1 billion and $2 billion cash infusion to New York City.

Although these transactions are described as sales, they really are not the same kind of sale that goes on in a private market, of course. They are a recapitalization of the system that allows a cash transfer to the city. There is a change in the institutional authority for operating the system, and a change in the pricing structure. Realistic user pricing *creates* financial value for the asset that generates the revenues. The real payoff financially is in the reorganization of the pricing structure that allows these assets to be operated economically.

The real payoff managerially, I think, is that these changes do not occur in a vacuum; they are not just financial changes. The entire authority is restructured, frequently with covenants that mandate much more professional management of the assets. They may require that three- and five-year capital plans be prepared, that maintenance levels be at a certain level, and that the pricing authority be changed so as to provide for financing maintenance and capital investment. These are large institutional changes, driven by financial considerations, but extending well beyond finances alone.

Even more extreme possibilities than that are in the works. Suffolk County, Long Island, is now in the very last stages of a negotiation that would lease its sewer system, or at least a part of its sewer system, to a private consortium that has been set up. It would obtain $177 million cash from the private investors in exchange for the rights to depreciate for tax purposes the asset that is already in the ground, the sewer system.

A lot of these financing alternatives, from a management perspective, would be mere gimmicks that produce a one time infusion of cash, if they were not linked to institutional reorganization at the same time.

But financial promises are going to be the entry point into institutional reform over the next decade. The greatest opportunities for management improvements may lie in these institutional reorganizations--the provisions made for better management, for capital planning, for pricing authority, for the assessments of system condition that the authority has to take on. It is an opportunity, I think, for the profession. There is a chance to convert a budgetary crisis into permanent management reforms.

GENERAL DISCUSSION

QUESTION: I am not familiar with what you talked about in terms of the Suffolk County sewer system and selling it. What is occurring in Congress? I understood you to say that it's before Congress.

MR. PETERSON: Well, the fundamental need is for a tax ruling. There is pending a request for an IRS ruling. Alternatively, the New York congressmen from that region have sought explicit legislative language that would authorize this type of sale and leaseback for tax purposes.

QUESTION: On the same question, should we not be concerned with the equity here? It is my impression that Suffolk County is not one of our poverty areas in the nation. And yet the net effect of this proposal would be for the federal government or the federal taxpayers through the federal government to subsidize it, because the ultimate tax reduction would otherwise be taxes.

If we are going to support sewer systems by federal funds, shouldn't we do it everywhere, or at least have some criterion of need?

MR. PETERSON: Yes. From a national perspective, I think it makes for terrible tax policy. At the same time, there are even worse abuses of tax leasing in the private sector. It's hard to discourage existing public authorities from taking advantage of the same tax laws that are being used on a much greater scale in the private sector. So in the short run, if that's what the law is, it seems to me that the public sector ought to take advantage of it. If you ask me whether the law is a wise law or not, in my estimation it's very unwise.

QUESTION: Looking around the country, other than Suffolk, do you see much of that going on? It's my impression that everybody thinks it might be an opportunity, but not many are really pursuing the go to private industry and lease something and you can take advantage of the tax law. Is my perception incorrect?

MR. PETERSON: Well, let me respond very briefly. I think your perception is accurate that only for public transportation facilities, which are made specific exceptions in the law, has leasing for tax purposes become an important financing element. There has been a lot of activity in rail systems and bus systems. Most of the rest so far is just talk. It's just talk because nobody wants to go out on a limb and give a legal ruling as to what the legal status of all this is.

As soon as Treasury rules, I think you'd find a much greater backlog of activity. Now, whether Treasury, in fact, will clarify its position or will continue to defer resolution for several years is uncertain.

QUESTION: I want to shift to another subject in an earlier part of your comments. For a long time, city government people have had to struggle with those special purpose things over the desirability of having priority established collectively so you can balance public interest. And one agency can do that; yet, in general, the further removed the utility becomes from that balancing operation, the more likely you are to have--or I should put it in the form of a question: Do you agree that, in general, if you remove the utility from that balancing operation to some extent, even though it may be within city government, you are more likely to have an effective financing operation?

MR. PETERSON: From the utility's perspective, you are likely to have more effective financial management and more effective preservation of your interests if you are institutionally separate and do not have to go through the central competition. Unfortunately, every laudable public activity is out there scrambling now to get this kind of institutional protection, either a separate authority or earmarked revenues that can only be expended on that purpose.

In sum, I think it probably makes for bad public policy that all these public purposes are competing via dedicated revenues and separate authorities. There is little room for general priority getting in the budget.

Now, what do I think is going to happen in a practical sense? I think you are going to see a continuation of this institutional spinoff, and I think water is well situated to compete.

DR. MARKS: Let me now first introduce Bob Clark from EPA Cincinnati. To a certain extent, all this concern about institutions and about financing presupposes that something will be done. And Bob is head of a research group that has looked at a lot of the questions of what can be done not only in a technologic sense but in a sense of improving the way that systems are managed, and has really begun the investigation into some questions that involve how much economies of scale there are in companies. You know, the "holy grail" of economies that may not exist.

Biography

ROBERT M. CLARK

ROBERT M. CLARK is assigned as a commissioned officer in the U.S. Public Health Service as chief of economic analysis activities, Drinking Water Research Division, Municipal Environmental Laboratory, Cincinnati, Ohio. He holds an M.S. degree in mathematics from Xavier University and a Ph.D. in environmental engineering from the University of Cincinnati, where his graduate work emphasized the application of systems analysis and economic theory to environmental engineering problems.

MAINTENANCE, REPAIR, AND REPLACEMENT IN DRINKING WATER SYSTEMS

Robert M. Clark
Environmental Protection Agency
Cincinnati, Ohio

Previous speakers have mentioned the urban infrastructure problem. Water supply has to be included as an element of infrastructure rehabilitation in the United States. A major element of this problem is the repair, replacement, and maintenance of water supply systems. I know that, on an operating basis, many of you are more familiar with these issues than I am, so I invite you to share your experiences with us.

I would like to review briefly some of the problems of repair and replacement in water distribution systems and then talk about some of the things that we are doing in EPA's Drinking Water Research Division. I will then suggest some analytical tools for evaluating repair and replacement problems and talk about some of the data acquisition problems we have had in terms of properly evaluating repair and replacement strategies for drinking water systems.

Approximately 211 million people are served by community water supply systems in the United States. At EPA we define a community water supply system as one that has 15 service connections for year-round use, or serves 35 nonresidents.

One of the problems we have had at EPA is that most of our regulatory attention has been focused on the issue of treatment. We look at it as a barrier to infectious disease, and we tend to overlook the effect that the delivery system can have on water quality. We also tend to overlook the fact that water utilities have responsibilities beyond water quality.

Potable water usage is listed by category in Table 1. As you can see, actual human consumption accounts for less than 1 percent of the total. If we also consider water supplied for fire protection and other kinds of institutional services, the utility's responsibility clearly goes beyond water quality alone.

A look at the relative economics of treatment and delivery shows that most of the capital investment in water supply is in the delivery system, and it is not uncommon for a system to have $1 billion of invested capital in current dollars for a medium-sized utility.

Certainly delivery accounts for the largest total expenditures. Table 2 contains the results of some studies that we have done. Water supply services are divided into support services, acquisition, treatment, power and pumping, and transmission and distribution for

TABLE 1 Potable Water Usage by Category

Use	Percentage of Total
Toilet	39
Bathing	31
Laundry	14
Dishwater	6
Kitchen sink	5
Lavatory	3
Utility sink	2
Human consumption	1

TABLE 2 Percentage of Cost by Category

Item	Support Services	Acquisition	Treatment	Power and Pumping	Transmission and Distribution
Operating cost	31	22	12	16	19
Capital cost	10	13	10	-	67

both capital and operating costs. Conservatively, we estimate that the distribution system accounts for about 6. percent of the capital. So we are talking about large investments overall, with a high percentage in the delivery system.

In addition to the large capital investments involved in delivery systems, a potentially high annual replacement and repair frequency exists, since many of the systems are old.

Table 3 was reproduced from an American Water Works Association publication and gives installation dates for selected utilities. By the way, I refer to Jim Manwaring in the audience for the source of these dates. He is our AWWA representative, and he can vouch for them. The dates range from 1870 to 1900, so we are talking about systems that have 80-, 90-, or 100-year-old pipes in the ground. Obviously, these systems are beginning to decay, and repair frequency is increasing. We need to repair and replace them.

TABLE 3 Date of First Pipe Installation for Selected Utilities

Utility	Date of First Installation
Manchester, NH	1874
Passaic Valley, NJ	1899
Duluth, MN	1898
Lake Zurich, IL	1915
Kansas City, MO	1880
Dallas, TX	1876
San Diego, CA	1890
Phoenix, AZ	1888
Orlando, FL	1900
Pueblo, CO	1875
Cincinnati, OH	1856
Kenton County, KY	1898

The design of a distribution system includes items such as land use, the natural features of the terrain, capacity requirements, and certain kinds of engineering design criteria. Table 4 summarizes the items that must be considered in addition to the engineering aspects of delivery systems.

TABLE 4 Parameters of Distribution System Design

Criteria for Distribution System Design (1)	Physical Design Consideration (2)
Basic land use/demographic parameters	Service area, land use, densities, population growth
Natural features	Topography (slopes), soil types, water table
Capacity requirements	Per capita flow, peak-to-average flow
Engineering design criteria	Pipe characteristics: Manning's n Joint materials Minimum pipe diameter Minimum velocity Maximum velocity Minimum and maximum slopes

We need to talk initially about land use densities, population growth in terms of natural features, topography, soil types, and capacity requirements. Only then should we consider certain engineering design criteria such as pipe characteristics, joint materials, maximum pipe diameters, velocities, etc.

We have been examining repair data on a case study basis. I want to talk about some work we are doing at the New Haven water utility along with several other utilities. A major problem is defining the right kinds of data and the development of a framework for collecting that information. The approach we have taken is to segment the system into a sort of surrogate hydraulic network, defining it in terms of links and nodes.

Using this approach, we have looked at system reliability and asked questions such as "What is a break?" Very few actual breaks occur. Many repairs are what might be called "maintenance events," and that is the approach we take. Thus, when a crew is sent out to repair a system, we count that action in our analysis. We have looked only at the joint or main-line leaks, and we have not included valves or clamps in this particular analysis.

In our studies we have looked at such variables as the pipe diameter and material, age, pressure differential, and absolute pressure; in addition (if we can acquire the data), we look at cleaning and lining, traffic overburden, problems of temperature (freezes and thaws), external corrosivity of the soil, and land use characteristics.

Analysis reveals that only a relatively small number of pipe links require a high frequency of maintenance; but for those pipes that require maintenance, the rate tends to increase exponentially. We also developed a set of regression equations to relate maintenance event history to the list of variables I have discussed. Figure 1 shows that for those pipes that did experience maintenance events, the time between one event and the next became increasingly short.

Equation 1 shows the relationship between the number of years to the first maintenance event and a set of key variables:

$$\begin{aligned} NY &= 4.13 + 0.338D - 0.022P - 0.265I - 0.0983RES - 0.0003LH + 13.28T \\ R^2 &= 0.23 \end{aligned} \tag{1}$$

where NY, number of years from installation to first repair; D, diameter of pipe in inches; P, absolute pressure within a pipe in pounds per square inch; I, percent of pipe overlain by industrial development in a census tract; RES, percent of pipe overlain by residential development in a census tract; LH, length of pipe in highly corrosive soil; and T, pipe type (1 indicates metallic, 0 indicates reinforced concrete).

Equation 2 represents the accumulated breaks over time:

$$\begin{aligned} REP &= (0.1721)(e^{0.7197})^{T}(e^{0.0044})^{PRD}(e^{0.0865})^{A}(e^{0.0121})^{DEV}(SL)^{0.014}(SH)^{0.069}; \\ R^2 &= 0.47 \end{aligned} \tag{2}$$

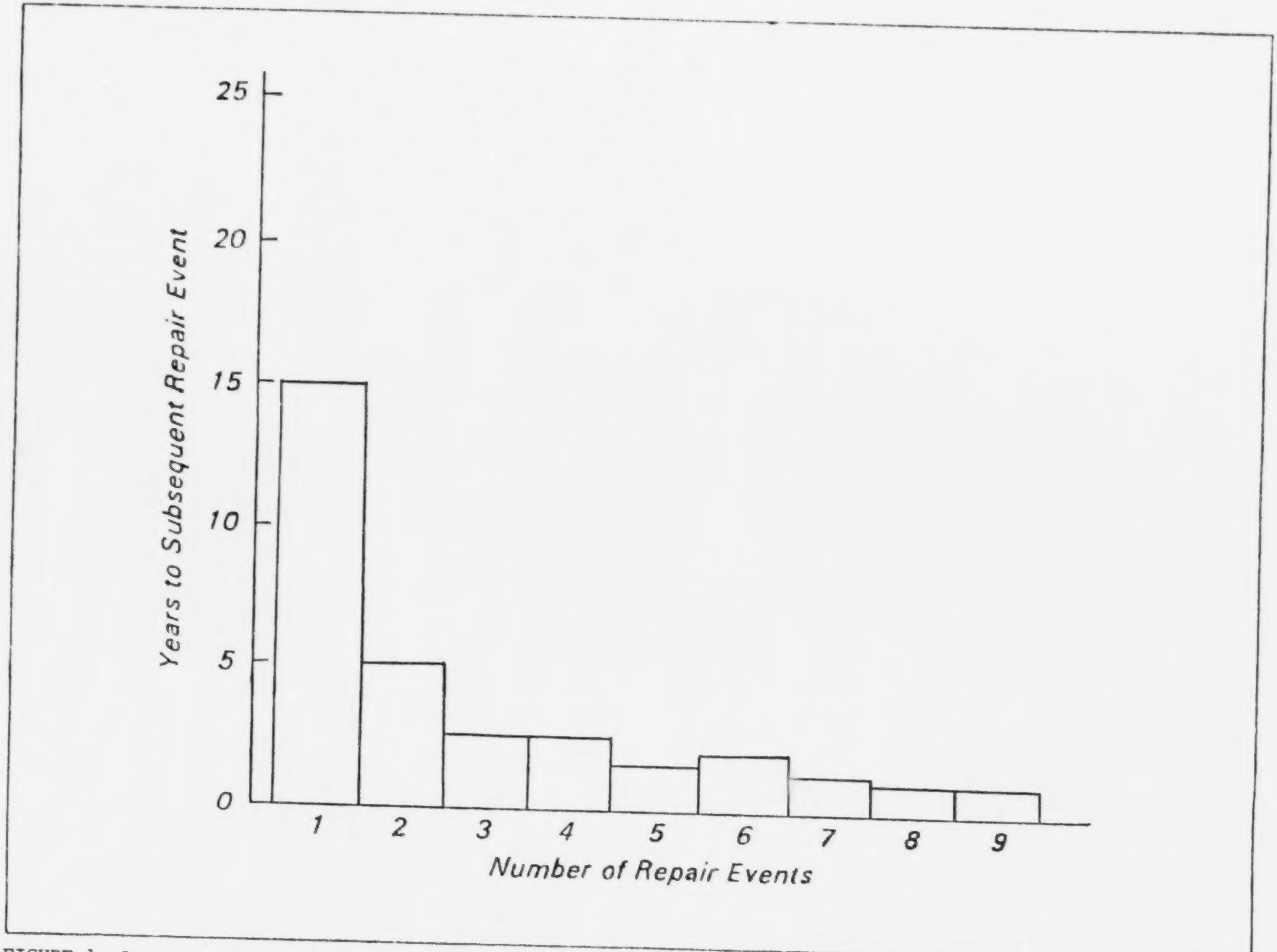

FIGURE 1 Average number of years to subsequent failure.

where REP, number of repairs; T, pipe type (1 indicates metallic, 0 indicates reinforced concrete); PRD, pressure differential in pounds per square inch; A, age of pipe from first break; DEV, percentage of land over pipe in low and moderately corrosive soil; SL, surface area of pipe in highly corrosive soil; and SH, surface area of pipe in highly corrosive soil.

The predicted events can be compared with actual events as estimated by Equations 1 and 2 (Figure 2). Equation 2 must be applied to each pipe individually to estimate the number of breaks over time. The solid curve in Figure 2 represents an average through the breaks over time, and the dotted curve represents the application of Equation 2 at each point in time.

With these kinds of data, an economic analysis can be performed to show optimal replacement strategies. Figure 3 illustrates such a trade-off.

We should emphasize that only a relatively small number of pipes have a high number of maintenance events associated with them. In one of our studies we found that even after 40 years more than 50 percent of the pipes examined had not yet experienced a maintenance event. These data indicate that a minority of pipes cause a majority of the maintenance problems.

A major concern we have is the difficulty in acquiring appropriate data. To plan properly for maintenance, repair, and replacement, methods must be developed to acquire, analyze, and interpret available information.

Our experience indicates that it is not obvious when sections of pipe need repair. Often those in charge who make the decisions have been with the utility for a long period of time, know intuitively where the problem areas are, and can make decisions based on their own experience. But when they leave, there is no historical record. No record of any kind exists in standardized form to permit any kind of quantitative evaluation in making repair and replacement decisions.

The other problem is data collection. We found that examinations of historical records are very, very difficult and time consuming. Essentially, the researcher must recreate the historical record on the basis of some sort of strategy. We have used this framework of a surrogate hydraulic network as the basis for our data collection.

A complete data base is absolutely essential. In my opinion, you must have the whole history of the pipe and of what is going on within the distribution network to make such decisions properly. But once you begin to have a properly structured data base and to identify the problem areas, you can begin to make some very critical decisions about the efficient repair points for lengths of pipe in the network.

If areas of the distribution system are failing on an exponential basis and you are using a linear depreciation schedule, the cost of repair will soon far exceed the capital you have set aside to repair and replace the system. So some potentially critical problems do exist.

If a system is failing exponentially, rates will have to increase rapidly at some point, and it will be critical to make those decisions

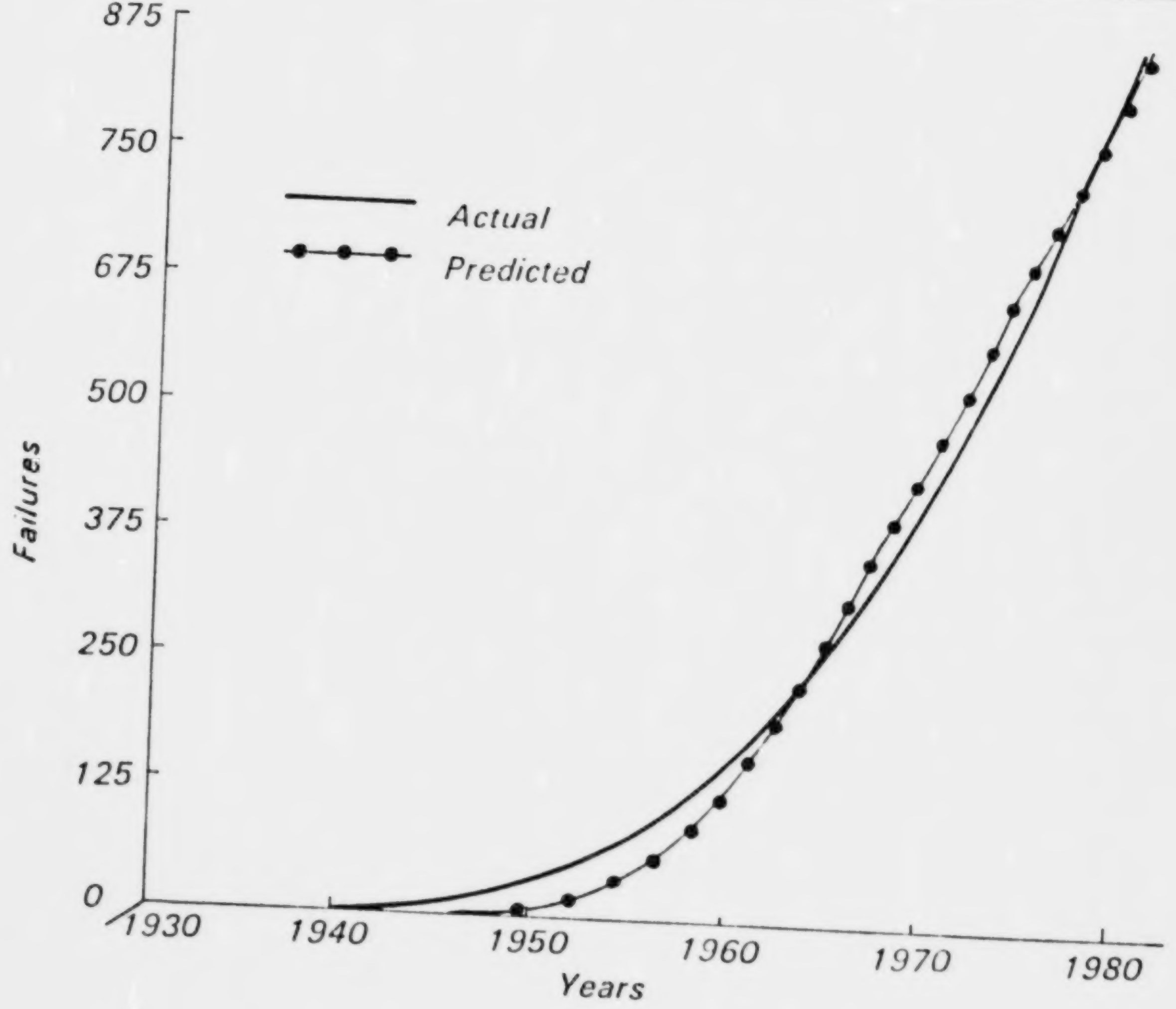

FIGURE 2 Predicted versus actual breaks for combined data set.

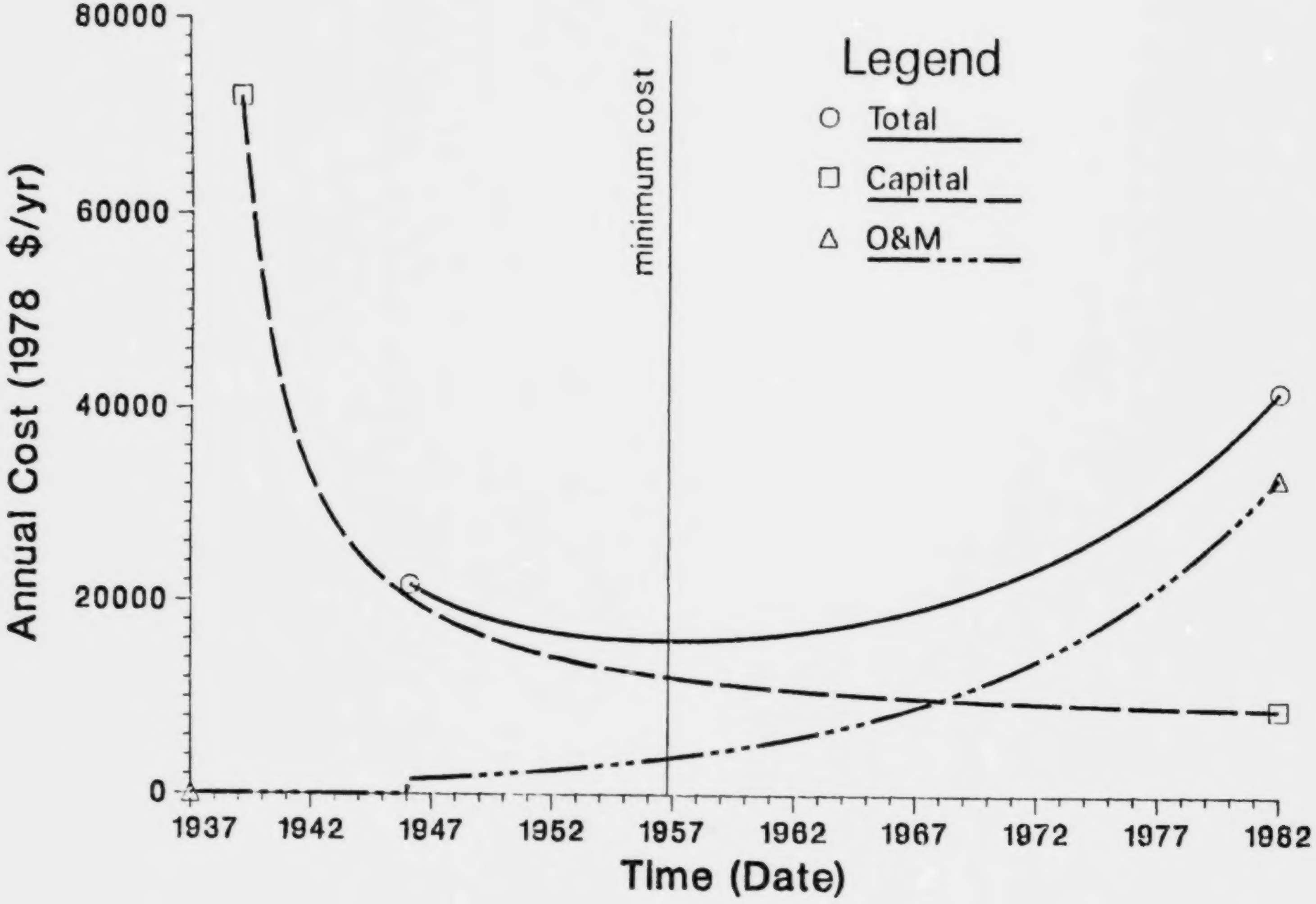

FIGURE 3 Pipe repair and replacement costs ($t_0 = 9$).

at the appropriate time. If not, we will be faced with the need for a short order series of rapidly escalating rate increases just to catch up.

GENERAL DISCUSSION

QUESTION: What is the percentage of cost of repairing a break, and what is the percentage in actually breaking the pavement, excavating, replacing, backfilling, and repaving? How does the cost divide among these operations?

MR. CLARK: I cannot answer that, but I guess it is in the replacement of paving and filling in the holes.

DR. OKUN: This brings up a question perhaps you could answer why have we not begun to address in our cities the question of anarchy under the streets, where every utility goes its own way, with its own crews, tearing up the streets.

You have all seen the cartoon of one truck driving away after having made its repair and another one driving in to start cutting up the same street. Getting into addressing these problems through utility tunnels where a lot of these costs which we know are not going to go away--they are going to be repetitive--why can't we make the investment in modern cities where we have many more services than water supply and sewers? We have cable television, we have telephone lines. Why can't we get these together into common utility tunnels and avoid these problems? Has anybody in the United States been addressing these problems?

MR. CLARK: It seems to me that years ago HUD had a program to look at innovative construction techniques, that went someplace--down the tube, I guess--to look at things like alleyways for service, garbage pickup, and other kinds of services, the sharing of utility tunnels, and so forth. But, as you know, most of it is an already-built system, and it would be very, very expensive to go back.

DR. OKUN: But I attended a conference, an engineering foundation conference, where it was clear the federal roads department was against having utility corridors along its interstate highway system. In other words, they just were not going to have it along the highway system. So there has been no great pressure to bring these people together, because we are rebuilding constantly, and in the next 20 years we are going to invest as much in rebuilding as we have invested in getting to where we are now.

If at some point we do not start to plan for something of a different scale and just go back to digging up a hole and refilling that hole--well, we will be doing that for the next 100 years.

MR. CLARK: It is an institutional problem of a different type, which is competing among the utilities.

QUESTION: As a utility manager, I think we have looked at that a number of times, and the so called anarchy under the streets is still much cheaper. It just has not been proved out.

DR. MARKS: In a retrofit sense, you are saying? To go back?

QUESTION: No. New or old, either one--new systems. There are also potential operational problems. When a utility goes out now on a failure, it probably will not cause all the others to go out, but in a tunnel it might put everything out.

DR. OKUN: There happens to be a utility tunnel that has been there for more than 20 years in the downtown area of a capital city, and it has been working very successfully and has not had these problems, because actually there is much less problem than there is in New York when a waterline does go out and does affect everyone--and that is in Madrid.

In Madrid they have utility tunnels, ventilated. You go down in them. You can walk for miles underneath, and you can see all the utilities lined up along the walls.

MR. CLARK: Is the problem in conventional engineers wanting to have the design? The thought has just not filtered through?

DR. OKUN: I think the front-end cost. The cost is the one every time you examine the front-end cost, because you have got to design them for a future population, but there are a lot of cities now that are not growing, and when you are replacing, when you are redeveloping an area, why should you go back in with the same thing? I see in Boston a redevelopment area where there was spaghetti under the streets, and when they redeveloped the area, they put the spaghetti back in.

QUESTION: There are two different problems. One is whether you put in a common structure, and the other is whether you have standardized locations. Those are two different things, and in the last category we have developed, at least in a number of parts of California, a convention for all new development in the last 10 or 15 years. No one has it written down, but there are reasonably standard locations. There are exceptions. Reasonably standard. But that is a good system.

QUESTION: The only point I was going to make is that your utility tunnel flies in the face, a little bit, of some of the old public health wisdom about water-sewer line separation. But I think that could be solved with a well-designed tunnel. I know we fight that constantly, for example, in trailer parks where they have common trench problems.

QUESTION: I would just like to echo some things that have been said. The Corps of Engineers thinks it is worth an effort to do this type of work because it does have a research program aimed at this type of analysis to help cities understand what is under the streets, so to speak, and try to point out some of the things that Bob has been talking about.

The Corps has research, which he is well aware of. We are not doing exactly the same thing, although we are very much coordinated, and we are spending dollars to do it.

DR. MARKS: I learned several things from this. First of all, you see the Band-Aid theory here that says you may not pay for the Band-Aid on a pipe. In fact, if you are starting to have trouble on a particular pipe, it suggests there is something generically wrong for which maintenance might not be a good idea.

And I see from your comment that if in fact you are a good public service employee, you make sure the break occurs on nights and weekends. We are now going to continue with our meeting. I would like to introduce John Boland from Johns Hopkins University.

Biography

JOHN J. BOLAND

JOHN J. BOLAND (steering committee member) is a professor in the Department of Geography and Environmental Engineering at Johns Hopkins University, where he teaches courses in water and wastewater treatment, environmental engineering, and environmental policy analysis. He has been chief of utility operations in the Department of Public Works of Anne Arundel County, Maryland, and superintendent of pumping and purification for Erie, Pennsylvania, and has done extensive research and consulting in both the private and the public sector. Dr. Boland is a member of the new NRC Water Science and Technology Board and of two NRC committees reviewing the Corps of Engineers Washington Metropolitan Area Water Supply Study. He is a registered professional engineer in the Commonwealth of Pennsylvania and holds a Ph.D. in environmental economics from Johns Hopkins University.

DEMAND MODIFICATION

John Boland
Johns Hopkins University
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I am here to talk about demand modification. Like the other speakers, I am concerned about those things that interfere with or are barriers to the efficient management of urban water systems, urban water resources. The barriers I am interested in are a little different from some of the ones you have heard about because they are not primarily institutional, financial, or legal barriers of the usual sort.

I want to address the barriers that may exist within some of the people who operate urban water systems. I am talking about some problems that have to do with the presence of information, perhaps attitudes, perhaps habits, and so forth.

My accusations--and if you read my paper, there are a lot of accusations in it--are really directed at a stereotypical water manager. Of course, people who attend conferences on the subject are not stereotypical water managers, so I am not talking to any of you, but you may know some people I am talking to. Of course, like all stereotypes, there are exceptions to this, and I can recognize those, too. The purpose here is to try to arouse you to some discussions of these issues.

I have made a number of assertions. The first one was that water utility managers do not adequately understand the factors that determine water demand. Now, if you ask the stereotypical water manager what determines water demand, he will tell you that people do. Well, people use water, obviously, and if you know how many people you have and what your per capita factor is, you know what your demand is.

Of course, we also know that people in one place use 40 gallons of water a day and in another place they use 300. And people in the same place use 40 on one day and 250 on another day. So it must be more than people somehow. And, of course, we know that it is more than people. It is a lot of things, such as housing characteristics, family sizes, people's income and life-style. It is a lot of things having to do with the kinds and nature of commercial, industrial, and institutional activities that take place. It is weather conditions, it is price, and many other things.

There is much literature on the subject, and most of it is good. Yet most water managers do not know that. They are largely unaware of the literature and of our ability to describe variations in water use, to the extent that we have the ability.

Another assertion I make is that water demand forecasts typically are of minimal assistance to water managers. Now this, of course, depends on what you think a water demand forecast is supposed to accomplish. If you think the purpose of water demand forecasts is to tell you what the exact water usage is going to be at some particular time in the future, none of them do that, except by chance. Basically no method does that.

I claim that the purpose of a water demand forecast is to help a manager understand the range of possible future water demands, plausible variations in demand that are going to occur in the future, to understand the sensitivities of demand to changes in assumptions (assumptions regarding population growth, economic development, income changes, etc.). These help the manager develop general insight into the mechanisms and dynamics of water demands so they can plan intelligently.

If that is the case, single variable forecasts--forecasts based on population--that produce a single number clearly do not provide this information. It takes rather more sophisticated and complex forecasting techniques to do so. The techniques are all there, and they have all been exercised. There are lots of studies that have used them in the literature. Yet in general, those methods are not used in the field, which is rather remarkable when you think about the size of the investments that are made based on forecasts that might take three or four hours to do. It is rather surprising.

My topic had to do with demand modification, something that is sometimes called demand management, and, of course, forecasting and understanding demand are part of it. But I will also claim that most water managers would be hard pressed to define what is meant by the term "demand management" and would be even harder pressed to explain why it had anything to do with their job.

Demand management means, of course, a number of things. In addition to the factors that are usually considered in managing water resources, the supply management part, providing supply facilities, and doing whatever is necessary to provide adequate supply, demand management means, for example, the consideration of water conservation as an element in management, of rate design and rate design changes, of drought management--anything that affects somehow, whether by law or by regulation or by incentive or by education, the way in which water is used.

Of course, the purpose, at least in my view, is to provide the service, water service, in the most efficient possible way. That may require a number of different kinds of actions; some of those actions might involve providing additional supply, and some may involve finding ways to use water more efficiently.

I might say something about the meaning of conservatism. Engineers, you know, are very fond of being conservative. It is considered a great compliment to be told that your design is conservative or that your forecasts are conservative. You might stop and think sometime what conservative means.

Conservation means conserving what, for whom? Usually what is being conserved is the engineer's reputation for always having built something big enough, not the engineer's reputation for not building something too big. What would conservatism mean to the consumers who pay the bill? Their definition of conservatism would be different, and that is usually not what it means when people use the term. Therefore I am saying that the whole job includes looking at both sides--supply and demand.

I spoke about rate design. That is my fourth point. By "rate design," I mean choosing all the elements of the rate structure, deciding what the whole tariff will be, whether you will use fixed service charges, block-type rate structures, single rates, increasing rates, or benefit assessments--all that goes into determining the total revenue of the utility.

The process of deciding what all of those elements will be and how each one will be calculated is what I mean by "rate design." This has usually been viewed as a financial issue with strong, sometimes overwhelming, political overtones. For the typical water manager the purpose of rates is to raise enough total revenue to cover the costs, and the purpose of rate design is to get that done, usually with as little political difficulty as possible.

Yet rate design and the rates that result from it do a lot more than that. They affect the way in which people use water now and in the future. They affect the efficiency with which water is used, and that is very seldom considered in the process of rate design. Furthermore, they have some other effects that are often ignored.

One of the problems that come up sometimes is the question of earnings stability. It is a question of matching revenues to cost when unanticipated events occur, such as unusual weather--for example, a particularly wet or particularly dry year or perhaps a drought. Of course, when those things happen, revenues change and costs change too. And many utilities have had the experience of revenues and cost changing in quite different ways, sometimes very much to their dismay.

The rate design should take that into consideration. The rates ought to track the cost in a way that if unusual events happen, the gap between revenues and cost should not change dramatically. So there are a lot of aspects of rate design that are not always considered.

Conservation is another subject that has been mentioned today. Conservation really worries some water managers. For example, the idea is that we are here to sell water. Why should we tell people not to use it? Our business is to sell it. After all, you don't see Lee Iacocca on television asking people to cut down on their purchases of Chrysler products, to find ways to stretch their cars longer.

You do not go out and find advertised on newspaper stands that you should share your newspaper with someone to conserve newpapers. Why should they do that? Why should those who sell water be any different? They are there to sell it, and is it not the job of the consumer to get the information about what it costs and what benefit they get from it and to decide how much to use?

Well, there are some problems there. It is an old habit for people in the economics side of this business to bristle when someone starts to tell them that water is different, because they say no. Water is a good like anything else. It is an economic good. It is not different. Well, it is different in some ways.

For example, consumers of water typically do not have the information they need to efficiently make use of the water they buy. That is an assertion I will make. Now the reason they do not is they may know what the price is, although with some rate structures it is exceedingly difficult for them to know what the price is. Somebody may say to them that water is going to cost them, with a sewer charge, $2.20 per 1,000 gallons.

How many consumers know what 1,000 gallons is in terms of their usage of water? They know what it is to flush a toilet or to take a shower. Very few of them really know what any of those activities cost them. The only way they can really tell is to change their water use habits and see what happens to their bill. But, of course, what happens to the bill happens months later, after all kinds of other events have occurred, including the weather change and all sorts of other things.

So it is extremely difficult for a consumer to link together cause and effect. Water is no different in this respect from, for example, electricity or gas. So the consumer has significant problems in making the decisions.

Furthermore, the price that is charged for water by and large reflects in no way the social cost of providing it, because the way prices are set has nothing to do with the social cost of providing water. And by "price" I mean the price per 1,000 gallons. I don't mean the whole price structure. I mean the price at the margin.

Now, that is not to say that the price is necessarily lower than the social cost. In my experience I have seen cases where it is much lower and cases where it is much higher. But in any case, if it is the same as the real social cost of providing it, it is only by chance, given standard rate-making practices. So we have got a case where we are not giving the consumer the right signal in the first place, and that signal is seriously blurred and distorted before they get it. It might therefore be appropriate to give them some help in finding ways to use water efficiently.

I should make clear that my notion of conservation is not simply using less water for the sake of using less. I think conservation is finding a way to use water in a way that makes everyone better off as a result. In other words, if you reduce the use of water so that water users are thereby better off, that is conservation, meaning that the costs that are avoided by that reduction in use outweigh the benefits that consumers would have had if they had used the water.

I am simply saying that the market itself is not going to do this, and the only way it is going to be done is from somewhere else, and I happen to think, at least, that it is part of water management to consider that.

My final point has to do with drought management. Managers view the timely provision of adequate water supply facilities as a primary responsibility. To recognize that conditions may arise in which the planned facilities will not be adequate is, to some, to admit that the planning was not properly done. Any finite supply facility can, of course, fail to meet demand, as a consequence of extraordinary hydrologic conditions, unusual demands, equipment failure, natural disaster, sabotage, or other reason. Such occasions have the potential for creating serious disruption and cost for water users. Drought management plans, when carefully and thoroughly prepared in advance, can greatly reduce the negative impact of these events.

Facilities sometimes fail to provide the services they were designed to provide. They can do so because of unusual hydrologic events, because of natural disasters, because of accidents, or even because of sabotage. Anything is possible.

The question is, what happens when the time comes to reduce demand? If you do it on some sort of ad hoc, hurriedly thrown together plan, it is probably going to be disruptive and costly to users. If you have a carefully thought out plan in advance, it is still likely to be costly and somewhat disruptive, but probably much less so.

But interestingly enough, once you realize what you will do if this plan fails to work, and you know what is involved in doing that, then you know roughly what it is going to cost. You are now in a position to make a trade-off between building more capacity and being prepared to reduce demand when the capacity is not adequate.

Obviously, if you are going to have facilities that are always adequate, they will have to be of infinite size. No one builds those. So we build something smaller that will with some probability fail to meet demands. How do you decide 100 years, 50 years, 10 years? There ought to be a way to decide, and the way to decide ought to be to consider what the cost is of not meeting demand, and then, what it would cost to avoid that situation. This is rarely done.

So my claim is that demand modification or demand management is very much a part of the water manager's job in an ideal world. It is, typically, not a part of the job that is performed in the world we live in, and I think our purpose here today is to talk about some of these points and find out why it is not and what that means.

My own prejudice is that there is a great need to transfer information. Water managers, typically, do not know enough about demand. They do not know what is known or what is in the literature, and what is known to other people is not being transferred to them. Also, there are a lot of other types of barriers that vary from one situation to another that preclude the kinds of things I am talking about.

GENERAL DISCUSSION

QUESTION: John, I think the conservation discussions occur only when you reach a crisis because you cannot deliver what needs to be delivered, be it electricity, gas, water, whatever, at the former rates. So, therefore, you get into the role of talking about conservation. And then you get into the fact that since prices are going to go up anyway, those that did conserve immediately are hit with a higher bill, and they say, "But we did all of those things. We conserve and yet you raise the prices on us," and there is a cynicism and lack of public confidence that gets built into it. How do you deal with that?

DR. BOLAND: You said prices are likely to go up anyway, and that may have been related to the conditions that brought about the crisis and the need for conservation.

This has occurred in some places, during the California drought, for example. When some unnamed cities in California pleaded with people to reduce water use, they did reduce water use rather dramatically, but some of those communities, as it happened, were charging a price at the margin that was substantially in excess of the avoidable costs, the variable costs. So when people reduced water use, the fixed costs then had to be spread over fewer units of water and the price went up, and exactly what you described took place.

In that situation I will claim that the managers did not do their job. They should have known that that would happen. First of all, they should have had some idea of how much water use was likely to fall. They knew enough about these things to be able to estimate that. Second, they should have known what effect that reduction would have on the price. Consequently, they either should have raised the price first and then asked people to reduce water use or should have implemented both actions simultaneously.

QUESTION: I have to rise to the defense of one of our utilities that I will be talking about a little later. I think, with all due respect to them, there is a political system in the city and county of San Francisco that caused the situation in which utility representatives said that this was going to happen. However, the elected officials and the Public Utilities Commission members were then unwilling to recognize the problem.

DR. BOLAND: True, and that is one of the things we are talking about here--those kinds of systems and what the effects of them are.

QUESTION: You can convince all of the water utility managers about rate structure, but you also have to convince the regulators that those are the proper methods to be dealing with, and that is really going back to what Carl indicated earlier to be really a concern in public utility commissions and their approach and their perceptions of what problems are and what the rate structure should be.

DR. BOLAND: Absolutely right. I am not trying to minimize the problems. I am saying that this is how it ought to be in the world. I spend a lot of my life in front of regulatory commissions, and I can certainly tell you that in the state of Maryland, in the case of electric utilities, the people's counsel (who is the consumer's counsel for the state) started in 1974 trying to convince the commission that something was wrong with the electric rate structures in the state and called on expert witnesses and presented major arguments in every single rate case from 1974 to date.

After dozens and dozens of rate cases, in the last 18 months we are starting to see minor changes in rate structures, and we have utilities now for the first time filing time-of-day rates and a few things like that, after an eight-year study by the commission. It is an enormous problem. The inertia there is unbelieveable, and I am sure that this is true in every state. I am sure everyone has his own stories on that.

QUESTION: One of the problems of the drought management you mentioned is that when you get a new generation of managers between droughts and there is a great deal that you can do if you were alerted, you are going into a drought before you get there. You look at the problems of New York and New Jersey in the mid-1960s or, again, the crisis when they suddenly found that their reservoirs would be only 40 percent full in 1980.

Therefore one of the technological tools we ought to develop (we had a little success with it in the middle part of the country, and you have also done some of it here) is some triggering mechanisms that tell that manager that you are going into a period of lower runoff. Also, during that first year your consumption rate goes up very substantially.

The fact that the per capita consumption rate goes up early in that drought, is something I think the British taught us; at least I was not aware of it until after the British experience. I think that can also be used, as you are talking about this management.

DR. BOLAND: That is right. At one time I had occasion to read some of the literature on droughts going back to the 1920s and 1930s, and the first thing I noticed was that at various times in history there have been some people that knew a lot about droughts. Unfortunately for Kansas, a lot of droughts were in Kansas at one time in the early 1950s and at other times. And if you go back to these papers you realize that here were people who had learned a lot, and you wonder what happened to that knowledge? I believe it just disappeared into thin air. I do not think that information is communicated. You are absolutely right. I do not think that it is communicated from one generation of managers to the next. I do not know what to do about that.

QUESTION: John, I was wondering how your various parameters for controlling demand could be applied to the small utility that does not have the resources that would normally be required to interrelate these demands. I am talking about utilities that serve less than 1,000 customers. What can they do in this area of demand modification when they barely have the manpower to operate the systems?

DR. BOLAND: I do not know. Maybe some other people have some thoughts about that. It is hard to imagine a 1,000-customer utility being able to respond to any of the concerns we have been talking about here today, and I do not know what they are supposed to do in the absence of that ability. One possibility, of course, is providing the services on a centralized basis to many small utilities--American Water Works Service Company model or something like that, or some public sector equivalent. But I cannot think of anything else.

QUESTION: You are right and I agree with you completely about the public notification or bringing the public into the decision-making process. For every utility in California that was criticized for raising rates after it called for conservation, there were an equal number of other utilities that were criticized because they did not have to raise the rates, despite a dramatic cut in consumption. People wondered, "How come when we cut our consumption 20 percent, you did not go broke? How come you guys were doing it? What is wrong with you?"

DR. BOLAND: Evidently the rates were set correctly.

QUESTION: John, what is your opinion about controlling demand through the rate structure? How effective is it?

DR. BOLAND: Many things affect water demand. If we had to make a list of what affects it more and what affects it less, price is one of them, but it would be pretty far down the list. The demand for water is quite inelastic with respect to price. Now, some types of water use are more so. Apparently, water used for residential sprinkling is pretty sensitive to price, but in general, water demand is quite inelastic with respect to price. Still, price affects it, and we have an awful lot of literature on price and water use. It seems to be of great interest to a lot of people.

Of course, it is of interest because of all the things that affect water use, price is the only decision variable. It is the only one the utility can change. It cannot change family size, housing type, or anything else. All it can change is price. So it has to be of interest to the utility, recognizing that it has a relatively small effect, all things considered. But it is part of an overall management package. You cannot ignore it.

QUESTION: They can change one other thing--metering practices. It is still common practice to put master meters in multifamily houses. If you put individual meters in there, while there may not be a direct relation, the figures say that it reduces the water consumption by about 40 percent.

QUESTION: I would assert that a manager can change one thing and have some control over the price, and that is attitude and awareness about water consumption and how it affects the system. We have had a tremendous amount of educational effort to do just that, and the usage patterns have changed dramatically from consumers' using the water in the afternoon when they come home from work and sprinkling the yard at the same time.

Now people are doing so much of it throughout the day and the early morning hours that our demand is not a needlepeak demand any more. So you can change awareness, and that is a lot better than changing price. So we can do two things, not just one. It is not a substitute for an efficient, proper price, but it is helpful.

DR. MARKS: Our next speaker, Dan Okun, as I suggested, is one of our architects of water quality standards, addressing the question of whether our needs in the water quality area will in fact put extra burdens and costs on the system.

Biography

DANIEL A. OKUN

DANIEL A. OKUN (steering committee member) is Kenan professor of environmental engineering emeritus, University of North Carolina at Chapel Hill. In his 30 years on the faculty of the university, he has gained note as a researcher on water supply management and pollution control. He is a member of the National Academy of Engineering and has served as chairman or member of many NRC committees. He is past president of the American Academy of Environmental Engineers and a member of the American Public Health Association, American Water Works Association, Water Pollution Control Federation, and American Society of Civil Engineers. He holds an Sc.D. degree from Harvard in sanitary engineering.

DRINKING WATER QUALITY: THE CHALLENGE OF HIGHER STANDARDS

Daniel A. Okun
University of North Carolina
Chapel Hill, North Carolina

I was asked to talk about the challenge of higher standards to the water purveyors. That can be translated into "the challenge of the Safe Drinking Water Act," which is essentially introducing these higher standards to communities throughout the country. Prior to the Safe Drinking Water Act, only those who served interstate carriers were obliged to meet these standards.

The Safe Drinking Water Act puts two kinds of requirements to the water purveyors. One deals with managers, the kinds of reporting and sampling they do; the other deals with quality.

The General Accounting Office review of the response to the Safe Drinking Water Act has drawn a lot of publicity, but most of the criticism was not directed to water quality issues. It was not related to anything that was health threatening but mostly dealt with whether these communities were meeting the management requirements that the law called for. And the fact that they were not is not a surprise. Most purveyors are too small to meet the management requirements of the Act.

This is not a real problem for the large water purveyors. Most of the large purveyors represented--out of proportion certainly in this room, as compared with all of the water purveyors in the country--have the capacity to deal with these problems quite easily. The larger purveyors are often located on rivers where they were from earliest days required to give attention to water quality; but even they became rather sanguine because the problem of bacterial contamination was easily addressed by chlorination. All that was of concern in those days was bacterial standards, and these posed no real problem.

However, in what has been termed the chemical revolution following World War II, synthetic organic chemicals were created and designed to be longlasting. They are also, of course, longlasting in the aquatic environment. Quite a furor was created in the water industry with the proposal of the Environmental Protection Agency (EPA) that all purveyors drawing upon surface waters install granular activated carbon (GAC) filters unless they could show that the filters were not necessary. Well, that was, of course, the wrong way to go about it.

But that is not the problem. In fact, the larger purveyors, those represented here, the East Bay Municipal Utilities District or the

Washington Suburban Sanitary Commission, could install GAC if they found that it would be helpful in assuring higher quality water.

An example may help illustrate the problem. Yesterday I visited the headquarters of the Washington Suburban Sanitary Commission, where they have a TV rainfall monitor that is exceedingly valuable for anticipating thunderstorms, which might result in power outages. This is a device an authority of the size of Washington Suburban Sanitary Commission can afford. It would be out of the question for most small water purveyors.

So there is quite a difference between addressing the problems of the larger purveyors--the ones that attend the meetings, the ones that give the papers, the ones that are in large number represented here--and the great number of small purveyors.

I will just try to put this matter of numbers in perspective. When the water utilities were required to be responsive to the Safe Drinking Water Act in 1975, I was writing a paper about regionalization. I got in touch with the Drinking Water Office at EPA and asked them what the numbers were. The paper is in your booklet, and it shows that EPA reported somewhat fewer than 40,000 water suppliers. Each year, as I kept writing new papers, new data emerged; the numbers kept increasing.

Mr. Elwell's paper shows almost 60,000 community water suppliers. We have not had 20,000 new water suppliers between 1975 and 1981; EPA and the states have only just begun to find many of them. If you cannot find them, if you cannot count them--and the number is rising still--how are you going to monitor them? It makes it a bit of a problem.

Some 95 percent of all the water supply systems subject to the act serve under 10,000 people. When EPA finally got its trihalomethane (THM) regulation passed, there was an exception: it does not apply to communities under 10,000. Now, I do not believe that people who live in communities under 10,000 are made of sterner stuff and can drink THM's with impunity. Life in a small town may be good, but it is not all that good that cancer or something that may be potentially carcinogenic would not harm its residents. Standards for foods and drugs are not less stringent for towns under 10,000, but they seem to be for water.

Obviously, the exception for small communities is not because EPA is indifferent to exposure to THMs in these towns. It is just that EPA recognizes, correctly, that communities under 10,000 simply cannot address that problem today. Maybe 20 years from now, they might. I doubt it, because by that time there will be other complex problems.

The THM issue is just symptomatic. Small communities just do not have the capacity to address many problems. Paul Noran raised the question about how demand modification might be addressed by utilities that serve fewer than 1,000 customers. The answer is that they should get together; either some larger purveyor might provide the special service for the small purveyors in their region, or some attempt at regionalization is required.

When regionalization is mentioned, it does not necessarily require that systems be interconnected with pipes. Not that interconnections are not a good idea where appropriate. I have spoken and written about the revolution in the British water supply industry. In 1974 they began their new organization, with large regional water authorities based on hydrologic boundaries. The water authorities own and operate all water-related facilities. They do not just coordinate, they own the water lines, the sewer lines, the water and wastewater treatment plants, the dams, and even the fishing piers. And they charge all the users for every service they get. They went into operation on April 1, 1974, and in the summer of 1975, they ran into what turned out to be the most severe drought in their recorded history. By the way, their records began in 1727. On a statistical basis, they estimated that it was probably the greatest drought that would be expected to occur in 1,000 years.

The fact that they were already administratively regionalized, even though their interconnections had not yet been built, enabled them to deal with that drought very successfully. Not one person-day of employment was lost in England and Wales during that severe drought. Yet, a much less severe drought, occurring at the same time in the United States, caused many disruptions in U.S. economic life.

The reasons they were able to face it were that, first,they had established a competent professional management structure to serve all water systems, large and small. Second, they could divert water from water-rich areas to areas in trouble. New water resource developments come on line at different times. With two neighboring communities, one may be operating with a reservoir that was built 50 years ago, and the demand of that community may exceed the yield of that reservoir. The nearby community may have a reservoir just five years old that has lots of excess capacity. There would be, of course, benefit to both if they were interconnected; new construction for the one community with its old reservoir could be delayed, and the other could earn a return on its excess capacity. Such joint management is now institutionalized in England, and planned interconnections were hurriedly put into place when the drought struck.

I have no illusions about our being able to adopt the British system, but we have many lessons to learn from them, and we have to adapt the principles to our setting. The American Water Service Company is a regional operation, providing economies of scale in laboratories and in many other kinds of services, such as financing, ordering, etc. There is another term I like to use, and this applies even more to water quality. Not only are there economies of scale, there are also efficiencies of scale. Things can be done that cannot possibly be done in the highly fragmented water industry in the United States today.

Many approaches offer promise. A consultant might serve many small communities to supervise their operation and management. It can be done by a governmental agency, by a consulting organization, or by a proprietary organization. I would not be so sanguine about us having any success except, of course, that the British system prior to its reorganization had been much the same as ours.

Probably the most emotionally laden issue in the United States that was responded to by regionalization was the public education. Public school busing originated long before integration. Public school busing was used to address the problems of the fragmentation of school systems to provide better education. Consolidation of schools affects families far more seriously than would regionalization of water management. Those who are wary of regionalization in the water sector are the public servants, the consulting engineers, the water officials, the real estate and development community.

The economists, in dealing with this issue, advised me that I was talking about the Pareto Principle. Well, I was like the man who did not realize that he had been writing prose all his life. The Pareto Principle is a principle of optimization where, in order for the large number to benefit, some may have to sacrifice. We have many instances of the positive effects of regionalization. Mention was made of the Washington metropolitan area. I do not believe that anybody suffered by the several water purveyors getting together; all profited.

But it does take leadership. And as Jake mentioned, how we create leaders or identify them when they appear is hard to answer. But I believe the water quality issue brings us back to the statement made in the very first paper, namely, that addressing water quality is not a technical problem but one of institutionalization and organization. The biggest difficulty is trying to bring people together. I am not speaking only about communities of 10,000; many water purveyors even up to a population of 200,000 do not have the capacity to monitor routinely for synthetic organic chemicals and to take appropriate actions when they find that such chemicals are present. We must have some movement, one way or another, toward regionalization.

While it is not reasonable to expect federal leadership in regionalization, it can be hoped that federal regulations would not impose barriers to it. Perhaps the best hope for stimulating regional arrangements rests with the states. Papers indicating the place for state initiatives have been the feature of recent conferences of the American Water Works Association. Meeting the challenge of sound water service, including water quality, is going to require institutional and technical innovations.

GENERAL DISCUSSION

QUESTION: Dan, you talk about the small systems--1,000 people, 2,000 people. Really, rather than combining the systems, why should we not look at selling them bottled water from the nearest system, when you talk about water quality? Might it, in effect, not be cheaper than extending a system 10 miles?

DR. OKUN: It's not cheaper, when you start examining the cost per gallon of bottled water. I have long been interested in dual water distribution systems. One of the questions always asked is, "Isn't it cheaper to provide bottled water for drinking and have the nonpotable water serve all the other purposes?" We have made studies, and bottled water is still far more expensive, even when you make it a government responsibility and deliver it to every house. The costs are very much higher than those for almost any system of piping water. This is always forcibly brought to mind by the experience with fluoridation. There were many proposals for how fluorides could be given to people. Even though more than 99.9 percent of the fluorides added to water are wasted, it's still cheaper than any other system we can devise of getting fluorides to the people to be affected. Piped water is a lot cheaper than manual handling.

QUESTION: Dan, would you care to comment on your forcing regionalization for water quality by more vigorous enforcement of the standards that are on the books? Many of the smaller ones aren't in compliance. And if they were hit with a fine, a threat, they would have no other alternative.

DR. OKUN: I don't really feel that's the way to go. I wouldn't like regionalization to be adopted under federal or even state mandate. I would like it to be done under local and state leadership. There has to be a demonstrated self-interest. If a community can't meet the drinking water standards and it is perceived as a health problem, or if they often run short of water, then local leadership should be educated to push for a regional solution. Tough standards would help, but it should not be in a punitive way.

QUESTION: Dan, in the paper you refer to the Water Act of 1973 in Britain. I think something like that in the United States would only come about after a crisis. You described very eloquently how they were there in time to deal with the crisis, but I wonder what the driving force was that broke down all those institutional barriers.

DR. OKUN: It was leadership. It was leadership in their civil service. Their civil service is quite different from our civil service. And I don't mean to derogate anyone in our civil service. But the whole pattern of their civil service is based on continuity; governments may change, but the civil service tends to be fairly steady. I interviewed the people who were involved in the regionalization, and they had started this really way back and had gradually prepared the groundwork for it, made the studies, and stayed with it. So it was leadership on the part of the government. However, that's a different society from ours, and I am not suggesting that we can do what they do.

QUESTION: Have you looked at the Dutch system and how they went about trying to decrease the number of water systems they had on a voluntary basis and encouraged it?

DR. OKUN: Yes. They began that actually many, many years ago, long before the British did. They actually have excellent water management, and they developed this largely because of local self-interest; they saw the savings that were involved. They were also the first to introduce effluent charges on a large scale, because they organized their basins in such a way that everyone who discharged in the basin had to pay. The charges were to be increased gradually, forcing polluters to undertake measures to reduce their charges in the future.

The Dutch, more than any, had realized that if they didn't get together, they would not be able to withstand the sea. All of their enterprises are those of cooperation. Both in The Netherlands and England they've realized that many social sacrifices have to be made for them to survive, considering their high density of population, their limited economic resources, and so on. Therefore, they're prepared to do things we are not yet prepared to do. Now we may begin to feel the same sense of urgency.

DR. MARKS: I think this morning's talks have been generic talks, looking at wider problems. It seems that each of the first five talks has begun to stress things that we did not know.

I have saved for the last our Medici of water research, Bill Butcher from the National Science Foundation. He has got a title that is called "Research Needs." I think he is going to give his catalog of research needs, but I think he is also going to give us something about how all of these problems get finalized and solidified and are brought to the public in a way that would be most effective.

Biography

WILLIAM S. BUTCHER

WILLIAM S. BUTCHER is director, Division of Civil and Environmental Engineering, in the Directorate for Engineering, National Science Foundation. He has served with the federal government as first director of the Office of Water Research & Technology, Department of the Interior; with the Office of Science and Technology; as chairman, Committee of Water Resources Research, Federal Council for Science & Technology; and as U.S. chairman of the U.S.-U.S.S.R. Joint Working Group on Cooperation in Water Resources. He has also taught and done research at the universities of Texas (Austin), Nevada, UCLA, and Sydney and New South Wales. He has a Ph.D. in civil engineering from the University of Southern California and is author of numerous technical papers on water resources planning, management, and research policy.

RESEARCH NEEDS IN URBAN WATER MANAGEMENT

William S. Butcher
Division of Civil and Environmental
Engineering
National Science Foundation
Washington, D.C.

I am speaking to you today on behalf of the research community. Although I am not an active member of it now, I am closely associated with it through the National Science Foundation (NSF). We all recognize that community is part of how we manage our water business.

Some of the practices discussed this morning are clearly products of research. These include land management and the report on dual water supply. These and many others are products of research and as such may get applied sooner or later.

With regard to basic research, we hope that it has application somewhere down the road, and that road often is very long. While applied research usually is thought of as having a much more immediate application, I do appreciate the opportunity to remind you that research is an important part of urban water management.

Let me speak about the federal end of the research community, that is, those of us in Washington who are responsible for sending the money out to the researchers, allowing them to do productive things. I am with the NSF, and our part of the research business is basic research. By this we mean the generic problems, not the applied problems, that agencies such as the Environmental Protection Agency and the Office of Water Research and Technology are largely concerned with. There are many agencies of government represented here today that each have a piece of the water problem. NSF's particular piece is basic research. Through research of all kinds, researchers can illuminate problems and tell us about the alternative ways of moving ahead.

The other day I came across a definition of engineering, but it applies to just about anything we are discussing here. It states that engineering is decision making under uncertainty and within constraints. What research hopes to do is to make the decision-making process better, remove uncertainties by replacing some of them with new knowledge, and maybe relax some of the constraints on how we do our business. I see all of these as the business of research.

The topic I was given was "Research Needs." I am always uncomfortable with the notion of needs, as it implies necessity. Yet, today we are running the water business, so, clearly, we do not need anything. There are many things we could use to improve the way we do business, but the water business is not held up for lack of something that is a necessity.

Research is a risk investment. The job of the research managers here in Washington is to minimize the risk as best they can. It is like advertising, where they say that half of an advertising budget is wasted, but you do not know which half. It is the same with a research budget. Some research does not pay off, but you hope that there are enough things that do pay off, that more than compensate for the inevitable losses. As I listened this morning, I realized that the water business is not just straight civil engineering. I am a civil engineer, and if you want to talk about that part of the water business, I can discuss the specifics. But it is really a socioeconomic, legal, institutional, technical mixture, and a lot of the problems would appear to be in the technical area. The technical problems are pretty much under control.

This is not to say that we can do the technical part. Costs can be reduced or our standards of service increased with technical changes. But some of the barriers to better water management--which is one of the titles that was considered earlier for this conference--are in the institutional, political, and legal realms.

The present administration for a time took a rather dim view of behavioral research and other social science research, yet it seems that is where the problems are in the water area. In the community area, we have talked here about regionalization. That is not a technical question but an institutional and a legal question. Demand management is largely a behavioral question. How do you do it? What baits do you hold out? What whips do you crack? I am sure that engineers cannot study this properly. Engineers are a part of the picture, but far from being the whole of it.

In spite of not wanting to list research needs, I want to mention a few areas where research has been productive and where research efforts seem justified in the future. My list is a grab bag of odd topics, but let me mention them.

Management comes first because, clearly, this is where the problems are. Management has a very interesting aspect, which came up this morning. In improving management the difficult problem is getting there from here. How do you make the incremental steps that will carry you forward to better management?

In the political arena, every step must, by itself, be appropriate, and the skill of the managers seems to be in devising arrangements that are available to us so that we can move forward. While we will always fall short of the ideal, let us hope that we have skillful politicians and managers who can identify the art of the possible and take us in that direction.

Research can often help us see our problems more specifically. I remember that years ago Dr. Okun wrote some articles concerning the dual water supply, which was a new look at the problem. He said, "Why do we always supply everybody with the same water?" That does open up a whole new way of thinking about the water business. Dr. Okun has been working on this for a long time, and he provided a fresh insight. This is the way research usually goes: providing fresh insights and giving people who have the problems new ways of looking at them. Research should show us the way ahead.

One of the problems that research could help us investigate is how we look at risk. How do we accommodate risk? How can we get the public to accept the risk of being out of water or being on reduced water supply? How can we get managers to recognize the risks?

Let me sum up by saying that at NSF, and, I hope, at the other federal agencies, we are looking for creative ideas. We have got public funds that the taxpayer gives to us. There are never enough funds, of course, but we look for the creativity that is out there, and we try to respond to it. I believe we do.

Our system of research relies on the creativity of the thinkers in this area; in other words, the university researchers who bring forward ideas. We hope that the federal government and other interested parties will have the resources available to enable these researchers to follow through on their ideas so that we can improve the ways in which we manage our urban water. The whole community pays the cost of managing our urban water but the benefits also accrue to the community. Funding research of this kind is an important task and one in which the federal establishment and others have been engaged in for many years in the past and, it is hoped, for many years in the future. NSF, for which I speak, has supported and will continue to support basic research in this general area. Whether it will lead to better urban water management or not is conjectural, but I believe that the community is well served if at least one federal agency allows researchers to work on basic topics that need not be tied to problem resolution but rather to increasing the level of sophistication with which we consider water and related problems.

GENERAL DISCUSSION

QUESTION: I would like to tell you some of my observations that concern this research, and I'll preface my statement that I think the American Water Works Association (AWWA) has gone a long way toward calming some of my concerns. First, I think the question should be coordinated between various organizations and agencies, so we lower duplication of efforts.

Second, I think the research should be prioritized, and once an agreed-upon priority scheme is set up, you know, follow that and have the various organizations performing research coordinate with those priorities in mind.

Third, I think there has to be some system of developing resources to perform this research, and in my opinion we should not depend on the federal government to support the research needs to the extent that they have been. I think the utility companies are willing to support the research and have demonstrated this over the past two years, when you look at the AWWA research budget.

Fourth, we should try to do more research and relate it to benefits and costs rather than just to pure research. I acknowledge that there's a certain amount needed in the area of pure research.

MR. BUTCHER: Concerning prioritizing and research dissemination or coordination, there have been attempts at this. There's a group with the Geological Survey, formerly at the Interior Department, called the Water Resources Scientific Information Center, which takes forms from each research proposal and puts them on file. You can also get their abstracts.

I'm a little out of date on this. I'm not sure what they do now. They are still alive. They will send out the survey, which is an attempt to see in one place all of these things, so researchers can consult the files and make sure that the research is not wastefully duplicative. If you say "no duplicative research," you are implicitly assuming that the guy who did the last research had the last word on it. But I don't think that research is quite that efficient and that anybody can confidently say his research wrapped up that topic and no one else can ever look at it.

As for research prioritization, there've been so many of these kinds of studies dealing with where the problems are. The Academy had one recently. By recently, I mean a couple of years ago. There are all sorts of studies going way back. Now, these are advisory. They're not management tools saying that you shall do this and that you shall wait to do this one. I don't know how you would institute this, and frankly, I think that's good if you have a list of problems. But if you are trying to say, give me your ideas, fellows, some of these ideas--you may really say, that you are going to see what comes out of this before you can even assign anything as a priority to a given problem.

QUESTION: It would be wonderful if we could all agree on a set of priorities and rankings, but we all have our own agenda. You, for instance, are interested in basic research. The American Water Works Association Research Foundation is interested only in applied research. Regarding EPA, as much as Bob Clark is able to squeeze out of them, most of their budget is related to regulatory research, improving regulations, or backing up regulations of some sort.

But our number one priority has been and will continue to be the transfer of technology. There's a lot of work being done out there that the water utility manager just does not know about. And rather than stress research, our big emphasis now is and will continue to be the transfer from the research arena to the workaday practical world.

AFTERNOON SESSION
October 14, 1982

Biography

FREDERICK H. ELWELL

FREDERICK H. ELWELL is the director and chief engineer of the waterworks in Manchester, New Hampshire. He is past president of the New Hampshire Water Works Association and the New England Water Works Association, and past chairman of the New England Section of the American Water Works Association. He is currently serving on the Board of Directors of American Water Works Association and on the associations's Water Utility Council and Executive Committee. He is also a member of the National Drinking Water Advisory Council. He holds a degree in civil engineering from Tufts University and is enrolled in the M.B.A. program of New Hampshire College.

SMALL-CITY PROBLEMS

Frederick H. Elwell
Manchester Water Works
Manchester, New Hampshire

I am reminded of the remark that people make about being from Washington. I am going to reverse that. I am from Manchester, New Hampshire, and I am here to help you. I guess that is the way we will deal with that particular scenario.

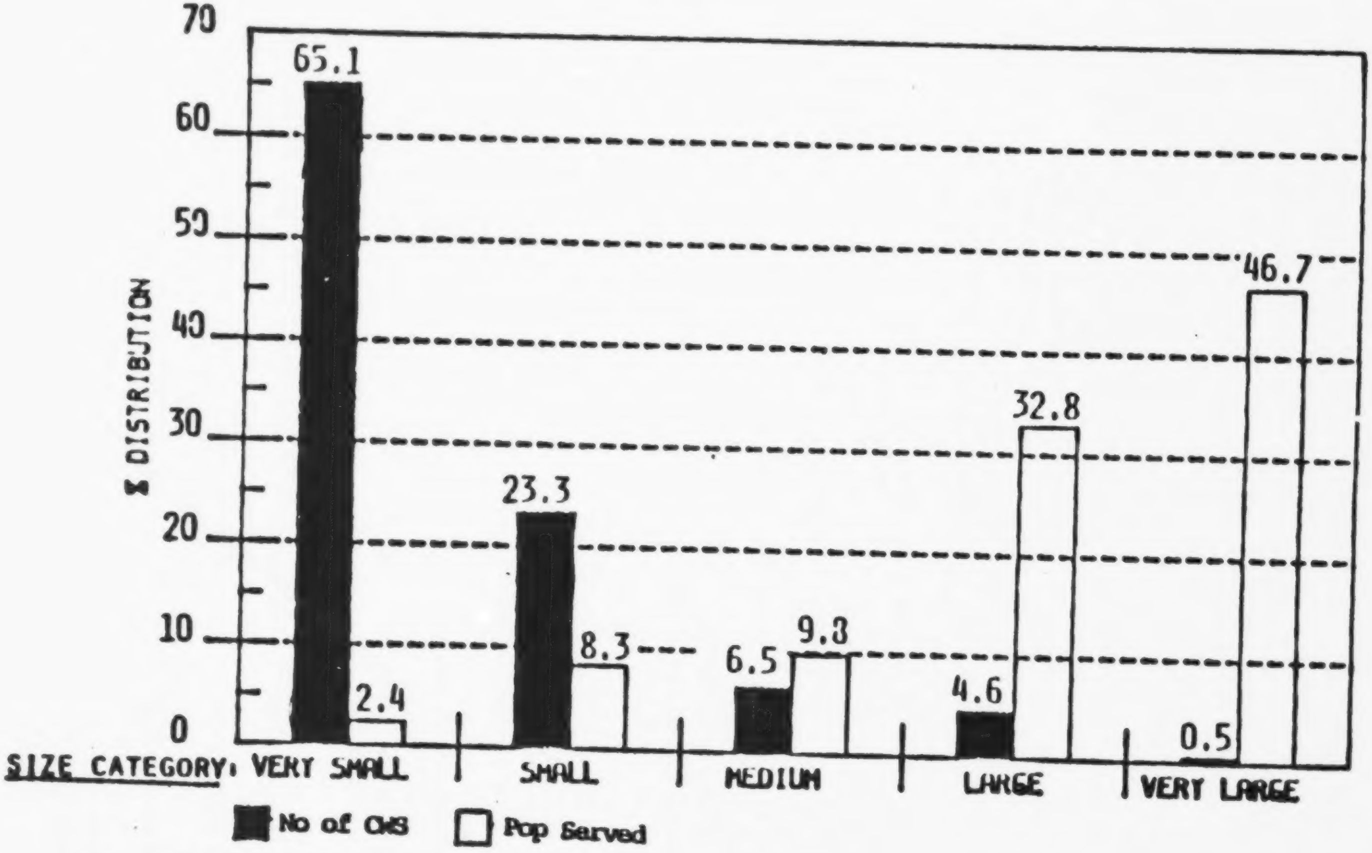
What I have tried to do is define what would be called a small urban system, as opposed to a small water system. A small urban system is serving a group between 10,000 and 200,000 people. Of all the urban water systems in the United States, I would suspect that our size system would represent about 75 percent. And you know, being in the same room with Bob McGarry and Paul Lane and Jerry Gilbert--those are the big boys. I am just one of the little kids from New Hampshire, and, you know, I get to talk to Dick Miller from Cincinnati and all of these major systems. Although we have the largest water system in New Hampshire, we are small time, but of high quality, I will remind you.

The first thing I want to do is just give you some perspective.

Figure 1, which was provided by the Environmental Protection Agency (EPA), shows the agency's definition of categories and how EPA defines sizes of systems. Taking those definitions of very small, small, medium, large, and very large, Manchester and other systems of that size would belong in the small (figure 1) category, in what we call a small urban system. The figure also shows that the very small, small, and medium categories constitute the majority of the water systems, not the majority, obviously, of the population served. And when you get into the very large systems, that is when you are talking about the majority of the population, but the smallest number of the water systems.

This morning we have had all of the theoretical presentations, and now I am going to tell you the rest of the story, namely, how a utility deals with regionalizing itself into supplying various areas.

Let me tell you a little bit about the Manchester Water Works. We serve 110,000 people. We serve Manchester and parts of five surrounding towns. The portion that we serve in Manchester is municipally operated. There is a difference in the rates. The only difference in the rates is that out of town we are allowed a rate of return on our investment; in town, we are not.



SIZE CATEGORY:	VERY SMALL	SMALL	MEDIUM	LARGE	VERY LARGE	
NO OF CWS's:	38,430	13,783	3,851	2,731	276	59,071(TOTAL)
% POP SERVED	2.4	8.3	9.8	32.8	46.7	

FIGURE 1 Size distribution of community water systems.

We have a surface supply. We own about 25 percent of our watershed, which is about 8,000 acres. We are involved in a major court case with one of the towns that we do supply, where most of our land is in right now, on what it is charging us for taxes. We think we are getting cruel and unusual punishment, so we have taken the town to court, which is kind of a refreshing point of view. Usually we are the ones that get taken to court, and we are reversing that procedure.

What are some of the problems that affect a small system or the systems that I am familiar with? The first is rapid growth, which affects the water supply. It should be common knowledge that the first supply you develop is the cheapest. The next one costs more money, and as you develop, you get into additional expenses. The problem of growth and these kinds of changes in our area and in other parts of the country constitute a major concern.

Another problem is government regulation, and, in deference to Bob and EPA, I do not necessarily mean federal regulation. I also mean the regulator who is in the Public Utilities Commission, as well as state agencies and state legislatures and municipal operations.

Another area that has been addressed in some respects is that of provincial attitudes. Everybody wants to protect his own. You have a major concern, and one that has not been addressed. What is the cause of it? One of the major causes is people in one community feeling that they are going to lose business if they supply water to another community. For example, when we were developing a regional system in Manchester, people were deathly afraid that if we put water out of town, all of the business would leave Manchester and would go out of town because the taxes were different, the rates were lower, and so forth.

Also, when we were developing our plans for the regional system, we ran into a cross fire because of wastewater. The community does not have to deal through a Public Utilities Commission, so the people get into a real problem in trying to twist the arms of the town. We ended up walking into that disaster area and trying to deal with them on a different basis, because we do it through the Public Utilities Commission--which is a pretty difficult situation.

Some of the urban systems that I am aware of have a real problem because of their lack of financial independence. That is not true in Manchester. However, it is true in a lot of systems, and I think this is true especially when you talk about infrastructure problems. Bob showed you this morning the year, i.e., 1874, when the pipe was put in in Manchester.

I do not think that we have infrastructure problems, because we deal with them. We put the money that we operated with back into the system. A lot of communities do not do this, and therein lies the problem. And I do not think that you are going to solve the problem by giving those communities money, because that is going to just solve it one time, and 20 years from now they will be back looking for some additional grant money. So I do not think that that is the solution.

I think financial independence, regionalization, is the important direction to hit. Manchester started supplying water to the towns about 1915, when we franchised some areas, very small areas. That continued for a period of time. But in the 1940s and 1950s, extensions in the towns ceased more or less. The reasons, again, were the provincial attitude.

In 1968 we did a few extensions and got into problems with the community. When we started getting some HUD (Department of Housing and Urban Development) funds for construction of a water treatment plant, it became necessary also, if we accepted the funds, to regionalize the system. That was the hammer that we were able to use to initiate the process.

What we have done now is develop a situation where we hired a consultant. We spent some time talking to the five surrounding towns and other communities close to Manchester and let our consultant go out and deal with the planning groups, and so forth, and say, "We have an ample supply of water and we are willing to supply you water; if you are interested, please let us know." After that initial step, we went back to them and discussed with them, if they were interested, what particular areas they were interested in receiving water to. The second phase of that project has just been completed. Once the areas were identified, we, together with our consultant, developed a computer model and designed a water system based on those demands, supplying both Manchester internally and those areas that have indicated interest on a long-term basis to the year 2005.

How do we supply them? Well, one of the original problems we had was that the communities thought that we wanted to operate the system. We have gone back and told them that if they had a water precinct or a town water supply in place and staff in place and they wished to continue that operation, we would just supply them bulk water at a wholesale rate. If they did not or if they wanted us to operate the system, we would operate it on that basis.

That removed a great deal of the friction between people. Obviously, those who were operating a water precinct felt very threatened that they were going to lose their jobs, and that was one of the barriers we had when we started out. So we tried to remove this and other barriers in the last few years and indicated that we were willing either to supply them water or to operate the system, and we, in fact, do both.

We have just signed our first agreement with one of the water precincts, in the town of Hooksett. So we will be supplying them wholesale water. Paul's company and the Manchester Water Works are in the process of developing the process for the town of Dairy, which is considering going outside for supply. Consumers would come from one direction, we would come from another, and the town is looking at where it will buy water from. The consumers are from Manchester.

So that is how we are proceeding, and that is how we are dealing with it. Part of the next phase is to determine, once we have identified the areas, what it is going to cost to supply water, and then let these towns know up front what their costs are going to be to get water from the Manchester Water Works, not just rates but also capital costs of getting water to them.

The town of Londonderry has spent about $4 million in the last four years to construct water facilities that we have designed and that we own, to supply water to a portion of its town. It is a lot of work. It requires a lot of people's time to establish a relationship, and that is really what we have to do.

I would also like to tell you that the towns do not hesitate to go to the Public Utilities Commission and always say what a great water system Manchester is and what a nice management they have, but they do not need any additional rates. They do not hesitate to do that. They still do. It is a good relationship, and, you know, that is the kind of thing you would expect. We do the same kind of thing with them in taxes. We do not think that they are right.

But that is an overview of how a small urban water system has gone about regionalizing its system and what I see as some of the barriers and some of the concerns to doing that in other parts of the country.

So, in conclusion, the key to successful management and operation of a water utility, no matter what its size, is financial independence by means of a reasonable water rate that allows the completion of necessary capital improvements, a reasoned regulatory approach in regard to both in water quality and water rates, and a regional approach to water supply and water works operation.

GENERAL DISCUSSION

QUESTION: Just a quick question. One, Manchester has its own water within the city area; it does not fall under the Public Utilities Commission?

MR. ELWELL: That's correct.

QUESTION: It's only when you purvey your water to the outside communities that you fall under their jurisdiction? That's the only jurisdiction they have?

MR. ELWELL: That's correct.

QUESTION: I'd like to comment on your third item, under small sewage system problems, provincial attitude. I think another problem right there is the lack of an enlightened utility management in the small systems. You mentioned them. They have a problem of wanting to maintain their own identity in their own town and not get involved with somebody else, to the detriment of their own utility.

MR. ELWELL: That is correct. It's a matter of letting them continue to operate. Another factor in regionalization that I think is important also is that it is not essential that there be a system connection. I think you can go in and do things. We train a lot of operators from other communities in Manchester in our laboratory and in our meter department.

We think that this is part of our responsibility as a large utility, in our state, to help educate the other systems. We do our own leak detection--the same kind of equipment, the same system that Jerry has in East Bay MUD--and we will do that for small water systems when they have a problem because they do not have any other way of dealing with it or getting in touch with it.

QUESTION: Why do you take the leadership? What is the motivation?

MR. ELWELL: Well, the motivation is the one of having available supply and the economies of being able to keep rates down by being able to supply more water within a certain area.

QUESTION: Your basic motivation is, if you take this it'll be better, and you've sold your service?

MR. ELWELL: Yes.

QUESTION: In these towns, what do they do for electricity? Do they have their own electric systems or are these part of a larger public service?

MR. ELWELL: It is a state public service company in New Hampshire.

QUESTION: Why is there a difference in the attitude? For instance, there's no hesitation about joining a larger electric utility, but with water there's a feeling they want to keep it themselves.

MR. ELWELL: Because they started out that way. They started out with their own water precincts, their own water system. Gostown is an example. In the village area, we supply an area with wholesale water of Grasmere, and also an area of Pennardville, and operate the system. They have been brought up under an electric utility, but not so in water. It's that attitude.

QUESTION: You say that HUD moneys required regionalization. Was that HUD moneys for drinking water?

MR. ELWELL: That was, yes, where they had the water and sewer grants in 1968, 1972.

QUESTION: So that was part of the stimulus that got you to that point?

MR. ELWELL: It was not part of our stimulus, but it was part of being able to convince the city fathers and the municipality that we didn't have any choice.

DR. MARKS: Did it require you to look at regionalization?

MR. ELWELL: You didn't have to do it, as a matter of fact. One of the things is, the Public Utility Commission in our state also is trying to reduce the number of small utilities in the state. They just gave us a rate decision and told us we can go back for another minihearing on four or five items after the first of the year for a second increase without going through a full-fledged hearing. But they tied that to doing a study of a very, very small water system in the town of Bedford, kind of indicating that we could supply them.

QUESTION: And the other question I had was, is the regionalization also for wastewater?

MR. ELWELL: Yes.

QUESTION: Is it all integral?

MR. ELWELL: They are separate from us. Because they have constructed a treatment facility, the state will not allow any other treatment facilities in the surrounding towns to be built. They have to connect to the Manchester system, and they were going through that discussion.

But, as you may know, a board of selectmen and a board of aldermen sitting down and holding those discussions--that is like putting a starving lion in a room with someone, because you know it just isn't going to work. That was what we walked into. But we got away from it because we had to send anything we did through the Public Utilities.

QUESTION: You mentioned an earlier concern that expansion of the service area would reduce or would bring about loss of competitive advantage. Does that attitude still exist or has it disappeared?

MR. ELWELL: It still persists with some people in the community. But generally speaking, that labor force is going to come from the Manchester area and its environs, and that is what we try to point out to them, unsuccessfully in some cases, but we still try to point it out to them.

QUESTIONS: In those regions where some of you may have had greater experience, what is the principal raison d'etre for going regional?

MR. ELWELL: Well, I don't know of a case, but I think there are cases where it would be water quality. But, if I understood Dan Okun correctly, that is going to be the issue coming up.

QUESTION: I recognize that. I just am curious in terms of other major issues that have dominated successful regionalization, other than supply currently. For instance, we have one in our state which covers part of five counties, where there are 68 municipalities and little towns which cannot meet the primary drinking water standards. Our regulatory people are climbing up and down their backs to do something. So yes, I think primary water quality standards are second only to the quantity issue in driving regionalization.

DR. MARKS: There are competitive advantages in having a potable water supply. Normally, big cities have control over that. Wastewater--again, it's whether you want the economies of scale, but you can treat it separately. A lot of times, those who got there first have got the best sources and have the competitive advantages. A lot of times, regionalization is enforced because people don't want to share water.

MR. ELWELL: I just wanted to cover one other point which was just lightly touched, and that was making sure that those communities that are involved in this understand the financial impact up front. I've been involved too many times in too many things where people have said, "Sure, we'll be glad to do it for you, and we want the blank check later on. We have found that we've been much more successful."

We got a franchise extension which we have to go to the Public Utilities Commission for. We have indicated to a community the four things that are going to have to be done to get that extension--a tank, a pumping station--and the relative costs that they are going to have to bear in order to get to that particular point first, rather than enter into negotiations and doing it later, because both parties may be wasting their time if the community is not willing to make that kind of financial commitment.

QUESTION: It just seems to me that one of the major problems of this regional plan relates to future growth and future demands on a system, which is finite. Could you say something about the arrangement you have with these five towns in terms of your commitment of supply in terms of their own expected growth? Is there a cap on the maximum amount of water you will supply?

MR. ELWELL: If we're supplying wholesale water, there is a cap in the agreement, and they have to renegotiate once they get to that particular amount. The development of a future supply, which is indicated in the report that we did, indicates that it would be the responsibilities of those seeking the additional water because it isn't going to be in Manchester. The first source is two lakes. The second source is the Merrimac River; that's about 80 million gallons a day that we will be taking from there when we need to, which is about--based on projections which we all know are subject to change--to the year 2003 or 2004.

QUESTION: Fred, some of these communities joining Manchester,--isn't the alternative to joining Manchester on the regional system no system at all? Aren't these communities that rely pretty heavily on individual groundwater?

MR. ELWELL: Three of them would be in that category. Two of them would be existing water systems.

QUESTION: So what is the primary motivation?

MR. ELWELL: Growth. But they could also develop a supply. There is a reasonable amount of groundwater. That's what Paul's system is; a groundwater system, as opposed to ours, which is a surface water supply. There are reasonable available water supplies, but when you start looking at it, it really didn't make sense for the town of Londonderry to develop a waterworks.

QUESTION: Is there any great difference between the enthusiasm in a town that has no system and a town that might have a small groundwater system? The receptiveness to your overture?

MR. ELWELL: Yes and no. I can think of a case on both sides. Londonderry had no system; they were very interested. Hooksett and one of its water precincts are also very interested in getting it. The town of Gostown says that they've got a fine, pristine groundwater source, and I said fine. They said that they want us to operate up to a certain point in their community, and from there on they'll operate. And we said that that's perfectly all right; whatever they want to do is fine with us. At least we know.

That was one of the problems; we never knew who wanted it and who didn't. It was kind of like Band-Aids, and we got tired of dealing with them one at a time. We finally said, "Look, we're going to do it one time and hopefully do it right." So that is where we ended up.

QUESTION: Do you have any difference of rates for peak users, encouraging them for storage?

MR. ELWELL: We do. If they have storage, we have a rate developed with their storage and pumping capacity. We have both cases: Grassmere, which doesn't have storage, about 80 houses; and central Hooksett, which has storage and pumping. And they're going to augment their supply with our water. That's one of their problems. They don't have enough.

QUESTION: Fred, do they put up the capital in the front end?

MR. ELWELL: Yes, they do. They did it by bond issue in their communities. We do the engineering and the inspection, hire the contractors, and send them monthly estimates. They send us the check, and we pay the contractor.

QUESTION: Is one of the advantages of a regional system in a smaller community the establishment of a firm water supply for industrial development?

MR. ELWELL: That is really what is going on in one of the communities. Londonderry, or rather the area that it is supplying, has basically light industry. Some of the other communities--Bedford, for instance-- are really bedroom towns to Manchester. Part of Bedford is residential; part of it will never be served, because the lot sizes are so large it's not economical; they'll be on individual wells. That is where we really get into the hassle; the industrial areas.

QUESTION: In other words, it creates a reason for investment in some of the small communities.

MR. ELWELL: Absolutely. Londonderry saw a major return on investment ahead of them by making that investment now.

DR. MARKS: Thank you Fred. Our next speaker is Jerome Gilbert from East Bay Municipal Utility District. He's going to talk to us about the politics.

Biography

JEROME B. GILBERT

JEROME B. GILBERT (steering committee member) is general manager of the East Bay Municipal Utility District. He has 30 years' experience in environmental engineering, with particular expertise in the planning, financial, institutional, and regulatory aspects of water management. He has been executive officer for the California State Water Resources Control Board and chief engineer and general manager for the North Marin County Water District. His public offices have included terms as chairman of the California Health Effects Advisory Committee (current), chairman of the San Francisco Bay Regional Water Quality Control Board, and vice chairman of the California Advisory Committee on Western States Water Planning. He was president of the American Water Works Association for the year 1980. Mr. Gilbert is a member of the NRC Water Science and Technology Board and of the NRC committee to review the Metropolitan Washington Area Water Supply Study. He is a member of the American Society of Civil Engineers and a diplomate of the American Academy of Environmental Engineers, and has an M.S. in civil engineering administration from Stanford.

COORDINATION OF MAJOR INDEPENDENT SYSTEMS

Cooperation in Bay Area Water Management

Jerome B. Gilbert
East Bay Municipal Utility District
Oakland, California

I was struggling for some way to characterize the current state of California's continuing effort to contribute to the nation's well being in water and politics. I was reminded of what we have seen so often in the western movies--the scene that is at the corral where the bottles are lined up along the fence. The competing gunslingers take alternate turns to see how many bottles they can shoot off the fence.

I thought about this scene when I was thinking about the initiatives slated on this November's California ballot, because Proposition 11 is an initiative that will assign mandatory deposits to returnable bottles, theoretically to reduce litter; and Proposition 15 is a gun control initiative that would require owners to register their pistols. Sandwiched between those two, 11 and 15, is 13, the "Water Resources and Efficiency Act." Thirteen has to do with water, which people have historically fought over in California. We have reached this point in trying to come to grips with the competing influence to protect the environment and to reduce demands in energy.

This initiative was developed largely out of a study done in the 1970s on water rights and groundwater. The study was sponsored strongly by the environmental movement in the state and follows on the heels of another controversial initiative that I will mention in a minute. It would require every utility in the state that imports more than 20,000 acre feet of water to have a water conservation plan, and you might say, "What's wrong with that?"

First, there are lots of utilities, including some very large sized ones, that import less than 20,000 acre feet and therefore are not covered. Second, it puts the control of the elements of the water conservation plan in the hands of an appointed state board. So all the major utilities in the state could not implement their programs even if they had achieved efficiency, unless that efficiency was determined to be good in the minds of the state board.

What I hope to talk about today is not so much that initiative, but I want to give you a little of the background. This may be redundant and not accurate for those who really know about California water, like Paul Lane and John, but I want to go through a little of the background of California water.

The initiative would allow, for the first time, fish to obtain a right to water just as people and industries presently can. That is, someone--a citizen or an environmental group or the Department of Fish and Wildlife--can go to the water rights board and get a prior right. In western water law, the first in time is first to have the right, so they can get a prior right, and then the burden of proof would lay with a diverter, even from a stream. There are not too many streams in California that have surplus water nowadays, but for those that do, the prior right would exist with the environmental or in-stream use.

There are other provisions in the initiative such as groundwater management plans for 11 basins, that again are to be determined adequate by the state. Finally, there is a requirement relating to a famous reservoir called New Melones. People had tried to stop this requirement with an initiative once before, and it is currently the center of battle between federal and state water rights. According to the initiative, the reservoir would have to be partially drained in order to restore white water rafting on the Stanislaus River. So those provisions are all in one package; the voters will act in early November on that one, between the bottles and the guns.

Now, I think that this initiative is an indication of the frustration that the voters of California have felt with the present water management system. Partly it is that; partly it is that the legislature has not been able to come to grips with these problems; and partly, I believe, it is just a sign of the times. It is not too hard to get a lot of signatures on petitions, and it is not too hard to convince people that water projects cost money and that everybody ought to be water efficient.

If you look briefly at the background of California, as most of you know, the rainfall occurs in the northern part of the state where we use a lot less of it than we have, and we use a lot more of it than we have in the southern part of the state. The numbers in Figure 1 show the contrast. Figures 2a and 2b show our river systems and some of our major water supplies that you may be familiar with.

In an attempt to right the imbalance that is created by that rainfall situation and demand situation I referred to, the first project constructed is shown in Figure 2a. The Federal Central Valley Project brings water from the Clair Engel Lake and Shasta Lake down into central California, primarily for agricultural purposes. The next one is the State Water Project (Figure 2b), which was built some 15 to 20 years later and is designed to bring water from the north, again to central and southern California.

The Delta area, through which all the water from the north flows by way of natural stream channels, is shown in Figure 2c. From this point south, it is in man-made aqueducts, using pumping stations and lots of reservoirs.

The Delta itself is a source of controversy. We had an initiative on the June ballot that was designed to finance a canal around the Delta, the Peripheral Canal, which would convey water for both state and federal projects, to prevent saltwater contamination and a variety of other factors. But, the package also included water conservation, wastewater reclamation, storage reservoirs for peak seasonal use, and a variety of things. That initiative was overwhelmingly defeated by

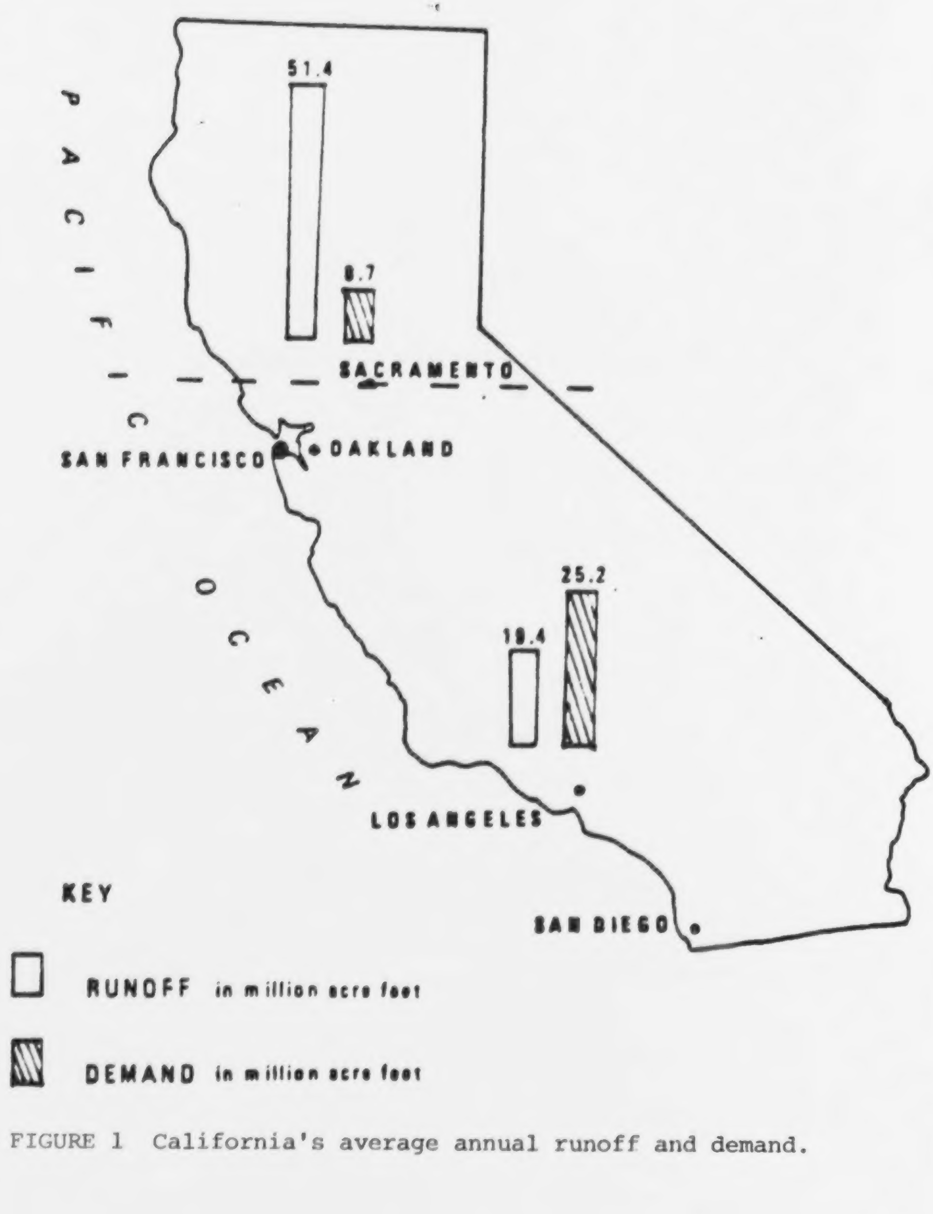

PACIFIC OCEAN
51.4
8.7
SACRAMENTO
SAN FRANCISCO
OAKLAND
19.4
25.2
LOS ANGELES
SAN DIEGO
KEY
RUNOFF in million acre feet
DEMAND in million acre feet

FIGURE 1 California's average annual runoff and demand.

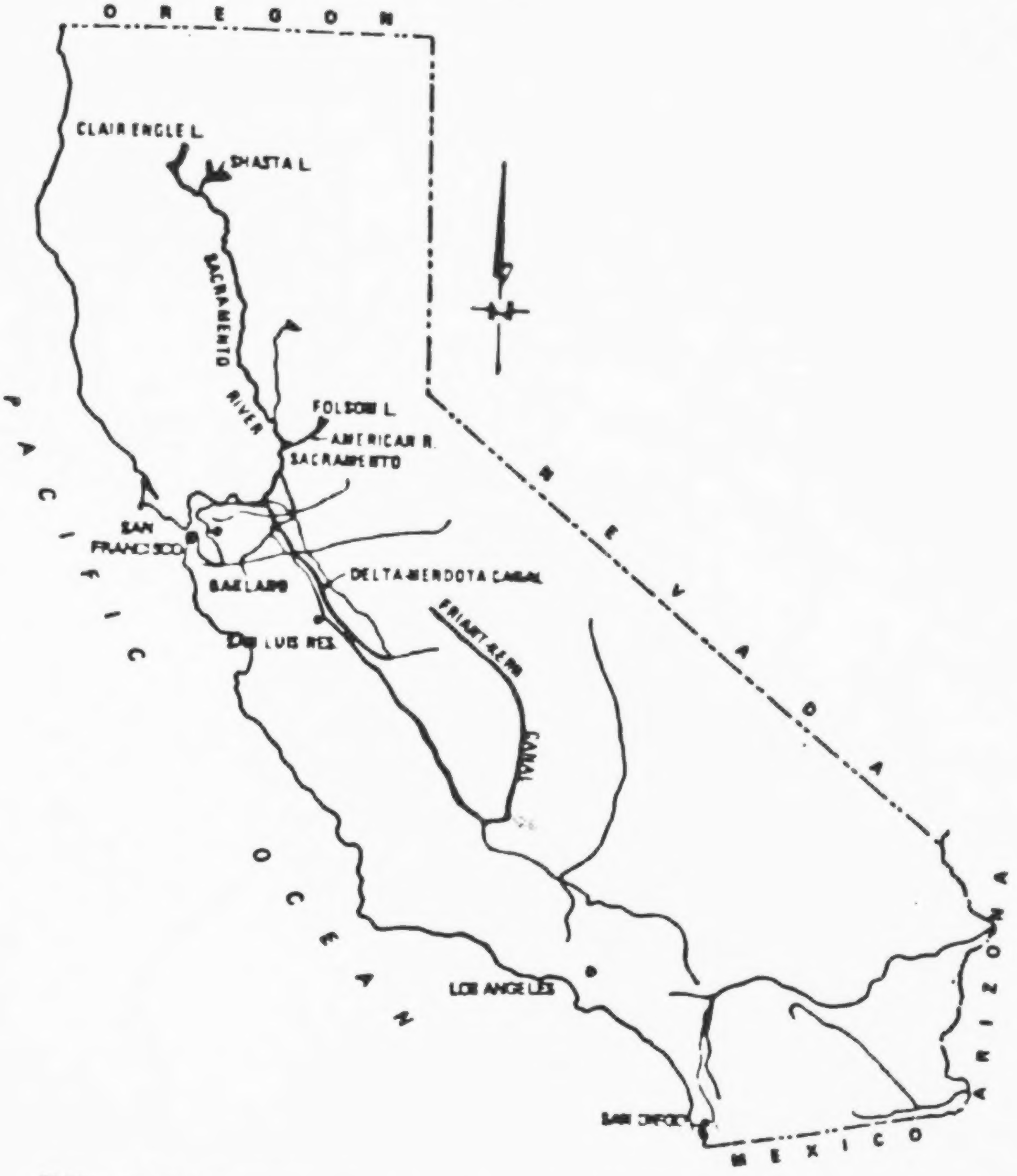

OREGON
CLAIR ENGLE L.
SHASTA L.
SACRAMENTO RIVER
FOLSOM L.
AMERICAN R.
SACRAMENTO
SAN FRANCISCO
OAKLAND
DELTA-MENDOTA CANAL
FRIANT-KERN CANAL
SAN LUIS RES.
PACIFIC OCEAN
NEVADA
ARIZONA
LOS ANGELES
SAN DIEGO
MEXICO

FIGURE 2a Major surface water transport systems in California: Federal Central Valley Project.

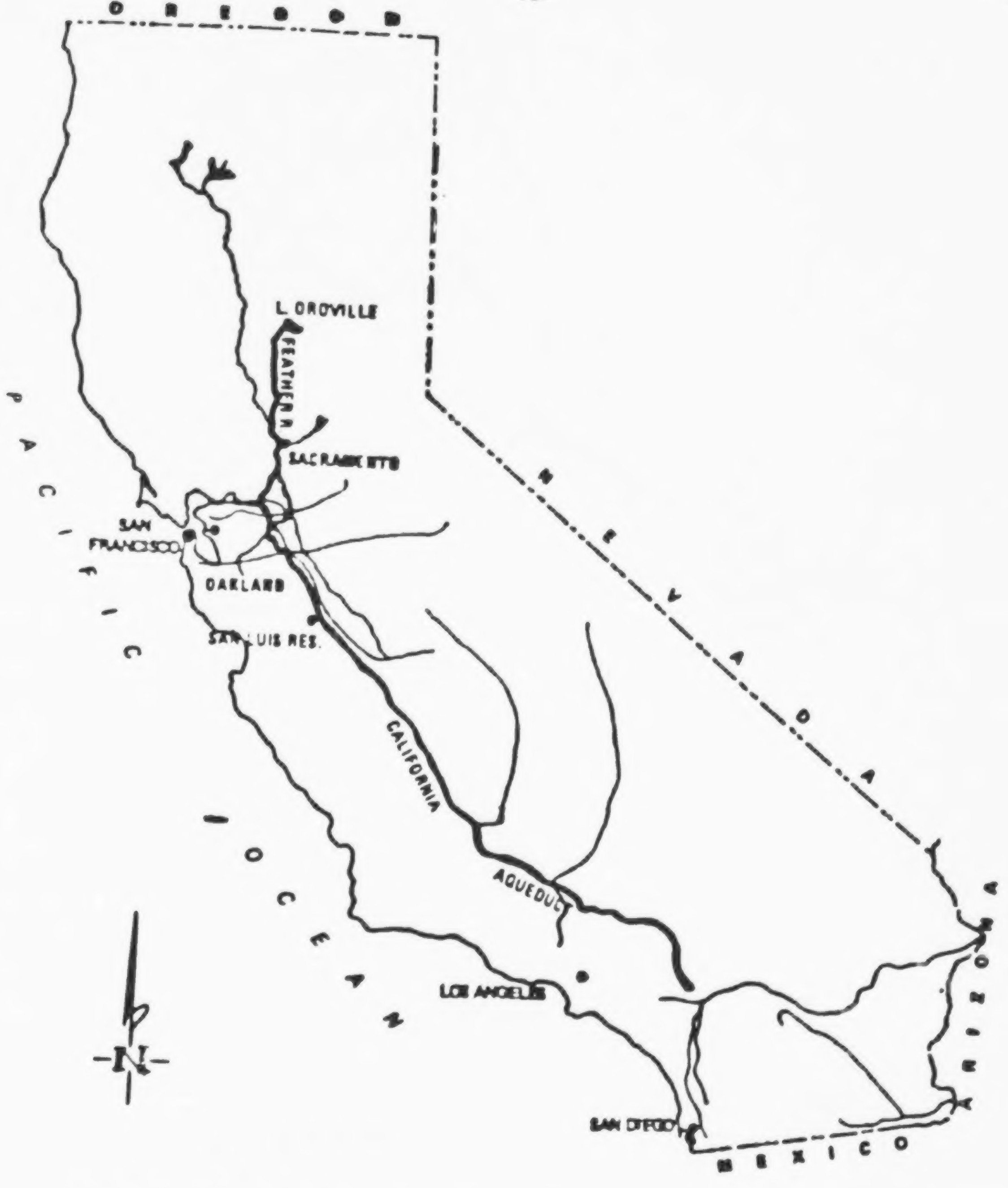

OREGON
NEVADA
ARIZONA
MEXICO
PACIFIC OCEAN
L. OROVILLE
FEATHER R.
SACRAMENTO
SAN FRANCISCO
OAKLAND
SAN LUIS RES.
CALIFORNIA AQUEDUCT
LOS ANGELES
SAN DIEGO
N

FIGURE 2b Major surface water transport systems in California: State Water Project.

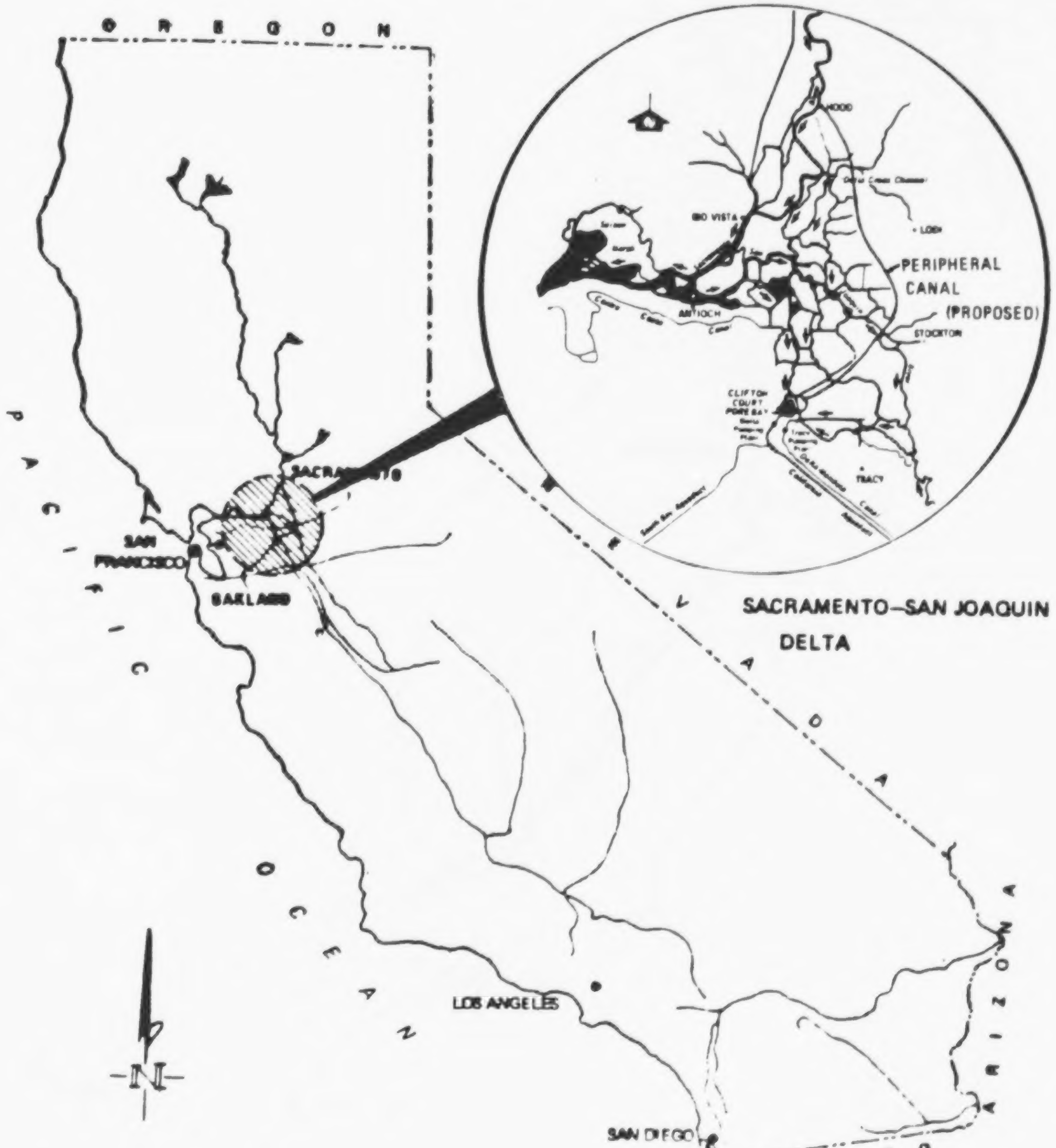

O R E G O N
N E V A D A
A R I Z O N A
M E X I C O
P A C I F I C
O C E A N
SACRAMENTO
SAN FRANCISCO
OAKLAND
LOS ANGELES
SAN DIEGO
N
HOOD
RIO VISTA
LODI
PERIPHERAL CANAL (PROPOSED)
ANTIOCH
Contra Costa Canal
STOCKTON
CLIFTON COURT FORE BAY
TRACY
SACRAMENTO–SAN JOAQUIN DELTA

FIGURE 2c Major surface water transport systems in California.

the voters of the state on the grounds that it cost too much and because of other issues.

It is against this backdrop that I would like to look at the water supply to the San Francisco Bay Area. We have the same problem east-west that the whole state has north-south. That is, there is a surplus of water in the eastern mountain areas and a deficiency in the San Francisco-Oakland area.

Figure 3a is just a locational map for those of you who are not familiar. Figure 3b gives an example of the water system coming from a variety of directions to serve the five million people or so in the San Francisco Bay Area. The big systems include: the northerly one which is the Mokelumne Aqueduct System, coming in from Mokelumne watershed, and the southerly one is the San Francisco Hetch Hetchy System, serving San Francisco's population and a lot of the people along the way.

Other major projects include the South Bay Aqueduct, an arm of the State Water Project that I referred to previously, and the Santa Clara Canal arm of the Bureau of Reclamation's project called the San Felipe Project.

There are lots of other projects shown there, too many to go into here. I will summarize by saying that there are six major independent water systems with no significant interconnections. In the face of the 1976-1977 drought, this was and still is a problem. People complained a lot about PL 92-500, but let me say that that law caused a lot of planning to be done around the country, just as a crisis such as the 1976-1977 drought did.

One of the planning studies done in the Bay Area as a subelement of areawide water management planning was a study of the various utilities in the Bay Area and how they might cooperate. This study looked at those six systems, and I want to talk a little bit about what the conclusions were and how things look today.

The Bay Area was divided into a number of subregions, shown here in Figure 4. They are the Peninsula subregion, which includes San Francisco; the South Bay subregion, which is a rapidly growing area where all the electronics industry is based; the East Bay subregion, which formerly consisted of heavy industry and still has a lot of oil refining on the north coast; the largely agricultural Napa and Solano subregion; and the agricultural and bedroom community in Marin and Sonoma subregion. Of course, Marin is where the most severe drought situation occurred.

During the 1976-1977 drought, all of the water utilities in the state that were affected got together to build a pipeline across a bridge joining Marin and Contra Costa counties. The pipeline was put in an unused freeway lane. The water users in Marin, when faced with an expenditure of money to make the pipeline permanent, representing a 3 percent yearly increase in their water bills, declined to make the expenditure this year, and so the pipeline has been removed from the bridge.

The water exchange was made possible by the Metropolitan Water District of Southern California's giving up its entitlement to some of the water that it would have received from the State Water Project.

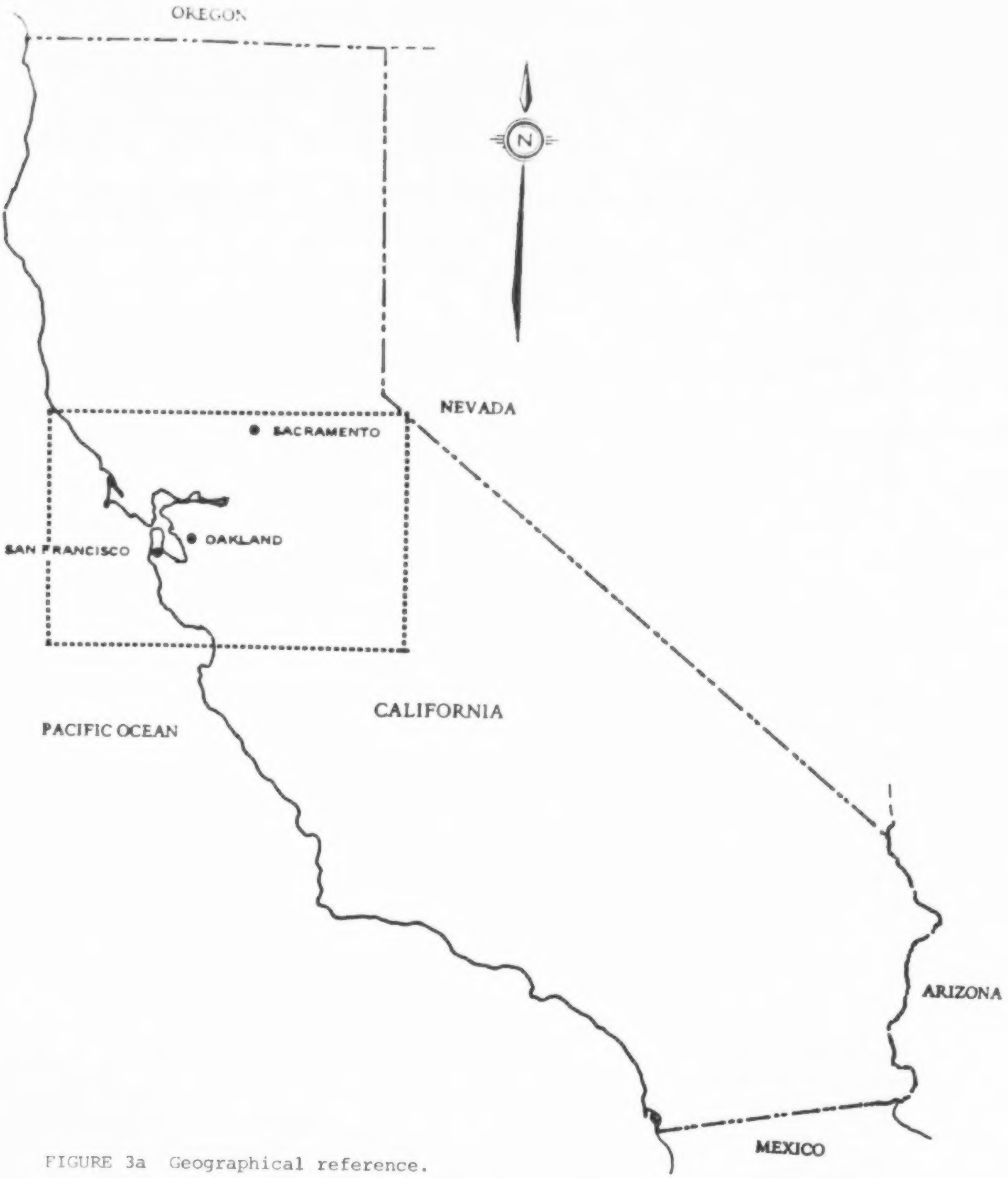

OREGON
NEVADA
SACRAMENTO
OAKLAND
SAN FRANCISCO
CALIFORNIA
PACIFIC OCEAN
ARIZONA
MEXICO
N

FIGURE 3a Geographical reference.

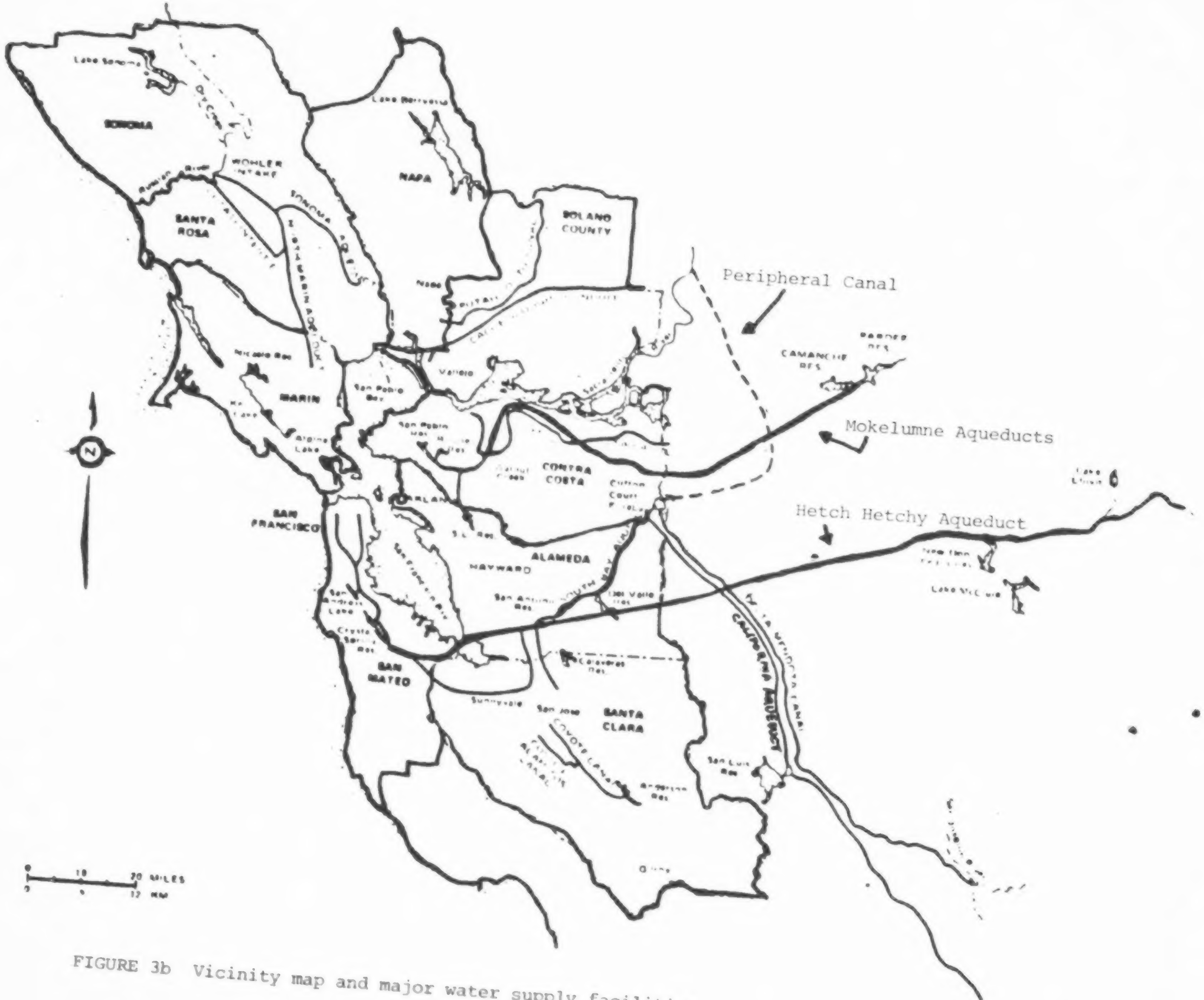

SONOMA
Lake Sonoma
WOHLER INTAKE
SANTA ROSA
SONOMA AQUEDUCT
NORTH MARIN AQUEDUCT
NAPA
Lake Berryessa
Napa
SOLANO COUNTY
MARIN
Vallejo
San Pablo Bay
CONTRA COSTA
Clifton Court Forebay
SAN FRANCISCO
ALAMEDA
HAYWARD
San Antonio Res
SAN MATEO
Crystal Springs Res
San Andreas Lake
Sunnyvale
San Jose
SANTA CLARA
COYOTE CANAL
Anderson Res
Calaveras Res
Del Valle Res
SOUTH BAY AQUEDUCT
San Luis Res
CALIFORNIA AQUEDUCT
DELTA MENDOTA CANAL
Peripheral Canal
CAMANCHE RES
PARDEE RES
Mokelumne Aqueducts
Hetch Hetchy Aqueduct
Lake Eleanor
Lake McClure
N
0 10 20 MILES
0 6 12 KM

FIGURE 3b Vicinity map and major water supply facilities.

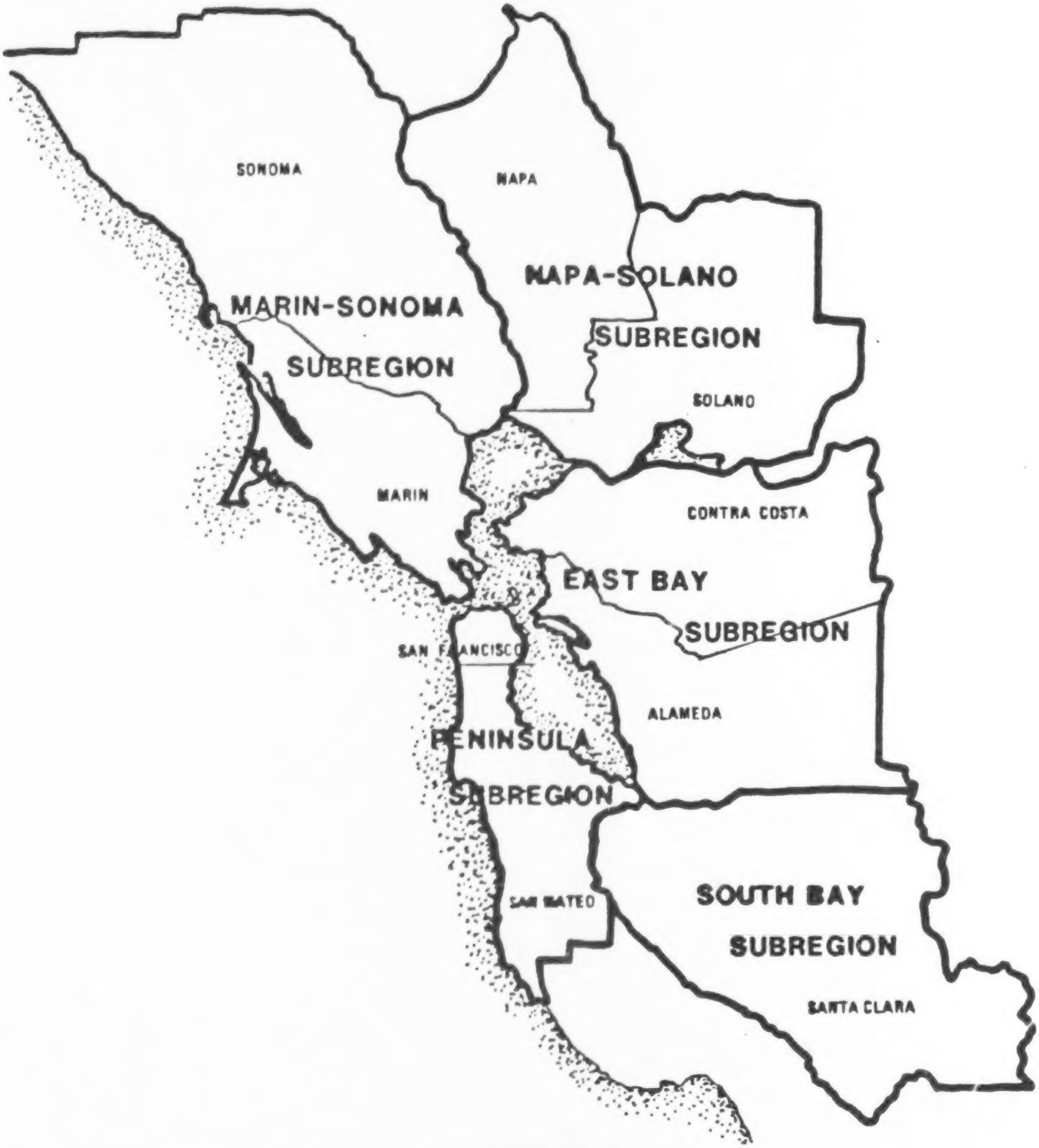

SONOMA
NAPA
NAPA-SOLANO
SUBREGION
MARIN-SONOMA
SUBREGION
SOLANO
MARIN
CONTRA COSTA
EAST BAY
SUBREGION
SAN FRANCISCO
ALAMEDA
PENINSULA
SUBREGION
SAN MATEO
SOUTH BAY
SUBREGION
SANTA CLARA

FIGURE 4 San Francisco Bay Region: Subregions.

The water was wheeled through the system of the East Bay Municipal Utility District and sold to Marin County at the border; and the state also played a part in the project. It was a remarkable cooperative effort, but the pipeline is no longer there.

DR. MARKS: Marin had gotten into trouble in the first place because they wanted to use lack of water as antigrowth.

MR. GILBERT: Yes, that is true. But in addition to that, they had some planning problems resulting from the way they calculated safe yield. These two things compounded each other. They are still fighting that battle, by the way, and the most recent occurrence is that they have built several local reservoirs in Marin County. The California Department of Fish and Game, under a very environmentalist administration in Sacramento, demanded that about two-thirds of the yield of the reservoir that they had built for domestic use be left in the stream for fish enhancement. That issue is being reviewed in the courts right now. So Marin, no matter how it struggles, with very expensive projects, water rates being doubled and continuing to go higher, cannot seem to be able to supply enough water to meet long-term demands. They still are in a very water-deficient position.

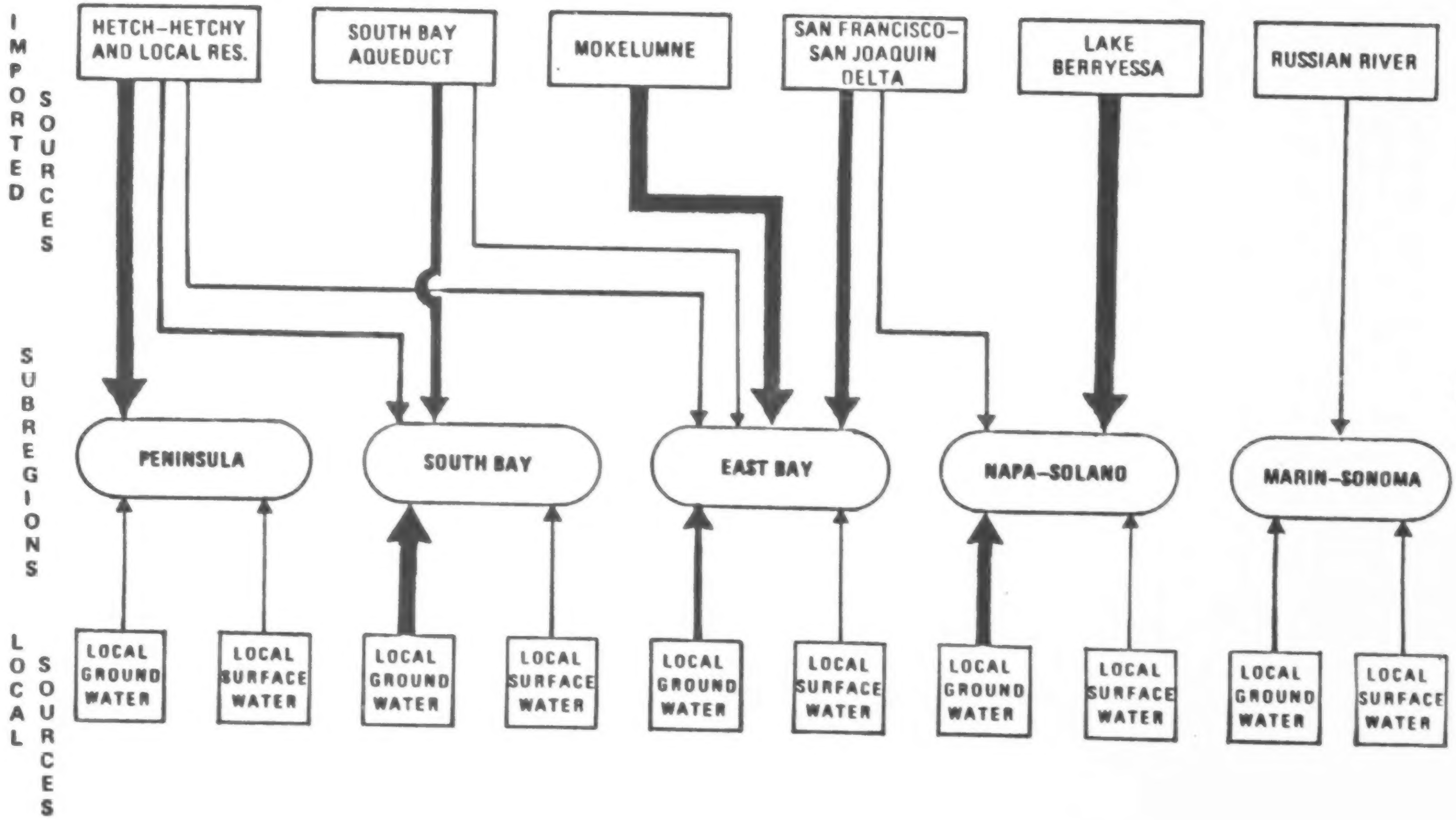
We can take a quick look at how complex this situation is. Figure 5 is an attempt to show the imported and local sources of water going to the subregions that were on the previous map. If you look at this figure, you can see that the major source for the Peninsula subregion is this Hetch Hetchy System of San Francisco, with some smaller sources--local surface waters and some groundwater.

In the South Bay subregion, we bring in the State Water Project by way of the South Bay Aqueduct--the San Felipe project, the federal project I mentioned before, is not shown here because it has not been built yet. Local groundwater is a major source but there are problems of groundwater overdraft and possible contamination. Mr. Gaston can tell you about it.

In the East Bay subregion we have a major Mokelumne System, diversions out of the Delta area that are direct because, if you recall, that subregion is adjacent to the Delta, groundwater, and surface water. The Napa-Solano subregion is supplied mainly by groundwater, and a big federal reclamation project, Lake Berryessa.

Finally, the Russian River is the single import source for Marin and Sonoma, of which Marin Municipal Water District (even before the pressures that Dr. Marks referred to) refused to participate in on economic grounds. Also, local groundwater and surface water are indicated, both of which are, even to this day, the total source of supply for about 200,000 people in Marin County. All these projects show that the Corps of Engineers ought to help the big cities get their share of the infrastructure improvement money. It is an indication of how water developed piecemeal in one regional area.

This summarizes the water supply situation and will lead into some conclusions. Table 1 shows each of those regions again, and the demand that occurred in 1980. The demand for the Napa-Solano subregion, at 659 million gallons per day, is by far greater than that for the others, but it is mainly agricultural demand. The other four subregions are mainly urban, and you can see from the present reserve


IMPORTED SOURCES
HETCH-HETCHY AND LOCAL RES.
SOUTH BAY AQUEDUCT
MOKELUMNE
SAN FRANCISCO-SAN JOAQUIN DELTA
LAKE BERRYESSA
RUSSIAN RIVER
SUBREGIONS
PENINSULA
SOUTH BAY
EAST BAY
NAPA-SOLANO
MARIN-SONOMA
LOCAL SOURCES
LOCAL GROUND WATER
LOCAL SURFACE WATER
LOCAL GROUND WATER
LOCAL SURFACE WATER
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LOCAL GROUND WATER
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LOCAL GROUND WATER
LOCAL SURFACE WATER

FIGURE 5 Water supply sources in the San Francisco Bay Region. SOURCE: "Water Conservation, Reuse and Supply," J.B. Gilbert & Associates, October 1977.

TABLE 1 Water Demand/Supply by Subregion

Subregion	1980 Demand (MGD)[a]	Reserve Capacity (%)[b]	
		1980	2000[c,d]
Peninsula	208	-11	20
South Bay	383	-15	5
East Bay	410	33	33
Marin-Sonoma	153	-29	22
Napa-Solano	659	-48	4
Region	1813	-18	15

[a] SOURCE: 1980 Water Demands and State Water Project Deliveries to the Nine Bay Area Counties. From Conservation and Use, Central District, California Department of Water Resources.

[b] Reserve capacity is equal to safe yield divided by demand.

[c] Assumes planned water supply projects brought on line, water demand increases, water conservation, and water reclamation.

[d] SOURCE: 1980 Demand from previous column, Safe Yields and 2000 Demand. From Water Supply Management Plan, Association of Bay Area Governments, October 1977.

capacity that San Francisco and the rest of the Peninsula subregion are deficient by 11 percent. That is, the safe yield of their water supply projects is 11 percent less than the current demand in that area.

The South Bay subregion has a 15 percent deficit, even with the imported water projects. The East Bay reserve capacity is plus 33 percent. Marin and Sonoma have minus 29 percent. The Napa-Solano subregion has minus 48 percent. That is largely due to groundwater overdraft and increasingly poor water quality.

On the right side, we have what the reserve capacity will be if projects now in the planning stages can be built, and that is a big if. The Peninsula subregion will have a reserve capacity of 20 percent if you can add a fourth barrel from the Sierra to the San Francisco system. The South Bay reserve capacity will be marginal, right at the break-even point. East Bay will still be plus 33, because of the diversion of additional water from the Sierras. Marin-Sonoma will be plus 22 because they are planning a connection to the Russian River.

Now, all of these future water supply projects are independent planning efforts. As part of that Bay Area study I referred to earlier, the regional program said that regional interties ought to be developed. The yields of each of these watershed should be looked at, and we should decide how and where to have interties. The attorneys all said that we have vested rights, that we have acts of Congress relating to some of these water supplies, and that there is no way you can tamper with those. You might agree to give people water on a short-term basis, but everything has to stay separate on the long-term basis.

Well, in recent years, some of the Bay Area water managers have been meeting on a regular basis in a group called the Bay Area Water Council. We have done little things first. First, we had an agreement to share emergency equipment and manpower when there was a seismic event or some special problem. Second, we have agreed on a mapping of interconnections. So gradually, we are beginning to look at where we might put things together. Third, we are working on collective water conservation. Instead of having advertising from six separate utilities, we now have collective Bay Area regional advertising. And on we go.

Now we are right on the threshold of looking seriously at interties. We will be required to do that if this water initiative passes that I referred to earlier, because we will not be able to build any of the projects that would yield the results of the right-hand column in Table 1 unless we first study efficient use.

Now, if we study efficient use, some of those projects might not be built; we might save some money. But the question I would like to put out is this: While we get efficient, as John Boland was saying, while we move, for instance, to some of the pricing concepts he talked about--and we are going to do that--and while we do a lot in water conservation and in wastewater reclamation that people are advocating, we will tighten up the system. That is, we are going to be closer to our safe yield in the traditional sense. When that happens, we are going to experience hardship from droughts more severely and frequently.

I wonder what the public sentiment will be 5 and 10 years from now when we are up against a drought. I think that because water, even during a drought, will be a very cheap commodity, people faced with the third year of a 25 percent rationing program will say, "Look, go build that Peripheral Canal, go build those pipelines; we want the water." Particularly if there is a relationship between the water and jobs.

So it seems to me that we are going through a cycle in which the traditional water managers that John referred to and criticized thought far in the future and the management board says, "If the economic investment is okay, we'll buy it." But they did not argue about the details concerning the future water supply situation.

We are substituting a political process of initiatives, and public opinion at the local level for legislative enactments, and that means a tighter system. It means less investment now, which will mean higher prices for water in the future. But in the end, I am not sure how far in that direction public sentiment would go, as long as the actual cost of water is as low as it is in most areas.

Now, I would like to perhaps conclude by going back to what I call the "premier" intertie. It has not, until this year, been spoken of even in back rooms or among engineers. The two largest import systems in the Bay Area are the San Francisco Hetch Hetchy System and the East Bay Mokelumne System. They parallel each other for 100 miles from the Sierras to the Bay Area. There are not now significant interconnections. San Francisco has a shortage situation coming up sooner than the East Bay. The East Bay can implement an additional project easier than San Francisco and with less potentially adverse effects on the environment.

I want to point out that the environmental effects in the Delta are caused by all these projects, not just the state project that transfers water across it and deprives that area of natural outflow, but also the Mokelumne system, which diverts upstream of the Delta, and many other smaller ones. The whole state has taken water out of the Delta pool and made it available. The two (aside from the Owens Valley project) highest-quality projects of the state are the Mokelumne and Hetch Hetchy projects; they are among the best waters there are in the United States.

We have quality identity between Mokelumne and Hetch Hetchy water. If we were trying to blend with the South Bay system that I referred to earlier or some of the others, we would be combining water that runs on an average of--just to use one yardstick--total dissolved solids around 450 to 500 with Mokelumne and Hetch Hetchy water that is in the range of 50. You would not want to do that, normally.

Our challenge in the next year or two before we can build any major water supply improvement is to find a way either to show that those interties are not cost effective or to build them. We are going to start that study very shortly.

I think what is going to happen in the San Francisco Bay Area is an eventual integration of water systems. Quality is a factor that we hope to preserve. I want to take another minute here and add to what Fred Elwell said when the questioning came about on the reasons for a merger or regionalization because I have got a specific current example that is very hot.

Paralleling the Mokelumne Aqueduct System is the Contra-Costa Canal. It is a raw water system that pumps water out of the Delta, and seasonally gets chlorides up in the 300 range, and sodium in the 200 range. People drink it, and they do not like it. A small area located northeast of the East Bay Municipal Utility District (EBMUD), with a population of about 300,000, receives that water of widely fluctuating quality.

The cities there are beginning to get a little restive. They want a better water supply, and they are starting to make formal moves to come to us. So everyone says merge. Immediately, the district that serves the area that operates the canal says they do not want any part of that and that they provide high-quality water. They certainly have one of the best water treatment plants that has been designed in the West. But the treatment plant starts out with a pretty bad product. The trihalomethane formation potential is high.

Well, how do you get around this? I think Fred had a point when he mentioned that maybe you do not insist on a theoretical regionalization. That is, you are not going to create an overall entity unless that has historically existed--as, for example, the Metropolitan Water District. What you can do is to find an institutional arrangement that allows the retention of the local distribution systems and then integrate in some way the supply system. I think that is the way we are headed here.

We already have a seven-person elected board in the present EBMUD service area by regions. We might add two additional representatives (in proportion to population) from that area served by the Contra Costa Canal. They would serve on the board solely for wholesale water purposes, solely for the purposes of water supply, and not deal with questions of distribution and replacement and maintenance.

Now, if we were discussing as professionals whether that is the theoretically correct solution, I think it is not. The theoretically correct solution on any efficient per capita cost basis is to completely integrate the two units. But you can get 80 percent of the advantages by doing it the way I have described. I think the real solution to the isolationist barriers, where utilities' legal or political arrangements prevent efficient solutions, is to try to find tailored ways of doing it, even though they might not be theoretically correct.

GENERAL DISCUSSION

QUESTION: On your last point, Jerry, about getting some of the benefits of regionalization without removing the local entity--we see a lot of that in our part of the country; a lot of independence in local communities. But they do want a reliable water supply, so they are willing to participate in the regional system to get the supply and still have their own direct relationship to their own citizens in operating the distribution system. It seems to work reasonably well, and it seems to have a lot of benefits and a lot of economies of the regional system.

MR. GILBERT: You know, there is a parallel example in connection with the wastewater program in the San Francisco Bay Area, if I might take a minute to describe it.

In the 1960s before PL 92-500, California did two things at once: It passed a very tough state water pollution control law. It also added a state grant program, so we were up around 50 to 60 percent of the cost sharing, and we also authorized a study of the most efficient way to treat sewage from the same area we have been talking about regarding water supply.

The solution was, according to the University of California study, a single primary treatment plant located in the Peninsula for the entire region and a long ocean outfall. The study cost $2.5 million dollars. By the way, to this date we do not have a common data-gathering and analysis system for all the San Francisco Bay, which is another interesting lack of cooperation that we are trying to work on. So that project was proposed, and all 70 of the waste dischargers around the edge of the Bay rose as one, formed their own regional agency in defense of an assault by the state government on their program, and proceeded to fight the state. The answer is the state won. Not entirely, but it won, and here is what happened.

We do not have 70 systems anymore; we have got about 11. Piece by piece, the pressure of the regulatory agency, the carrot of the grant, was able to cause regional consolidations. The concept we now have is secondary treatment with discharge to the Bay, but we have it in 11 systems. Those discharging to deep water probably do not need secondary treatment entirely, and those discharging to shallow water probably need more than secondary treatment. Therefore, it is better than it was.

QUESTION: Do you need any state approvals for you and the others to get together?

MR. GILBERT: Yes. We have to get a permit to change the place of use. Every water supply agency in California has a designated place. We may have to amend the Raker Act under which California built the Hetch Hetchy, which is a federal act. If Proposition 13 passes, we have to get the permission of the State Water Resources Control Board, which will also deal with water rights in terms of efficient use. And there are probably lots of other agencies to deal with. But, I think more importantly, we would have to fight the environmental battle in terms of our own environmental laws in California that could be the subject of lawsuits against us. So it is a long-term project.

DR. MARKS: Next is Bob McGarry from the Washington Suburban Sanitary Commission, a success story.

Biography

ROBERT S. McGARRY

ROBERT S. MCGARRY (steering committee member) since 1977 has been general manager of the Washington Suburban Sanitary Commission of Hyattsville, Maryland, responsible for all phases of operating a large water and sewer utility. Before then, he was a career officer in the U.S. Army, with assignments as deputy commanding general, U.S. Army Computer Systems Command; director of Management Information Systems, U.S. Army Europe; and district Engineer, Baltimore District, for the Corps of Engineers. He is a registered professional engineer in Maryland and New York. He holds a B.S. in engineering from West Point, where he was also professor of mathematics, and an M.S. in civil engineering from the University of Illinois.

POTOMAC RIVER BASIN COOPERATION: A SUCCESS STORY

Robert S. McGarry
Washington Suburban Sanitary Commission
Hyattsville, Maryland

I want to talk about the Washington Metropolitan Area Supply Task Force, and I did bill it as a successful example of regional cooperation, since we have solved a problem that has been plaguing this region for 20 years.

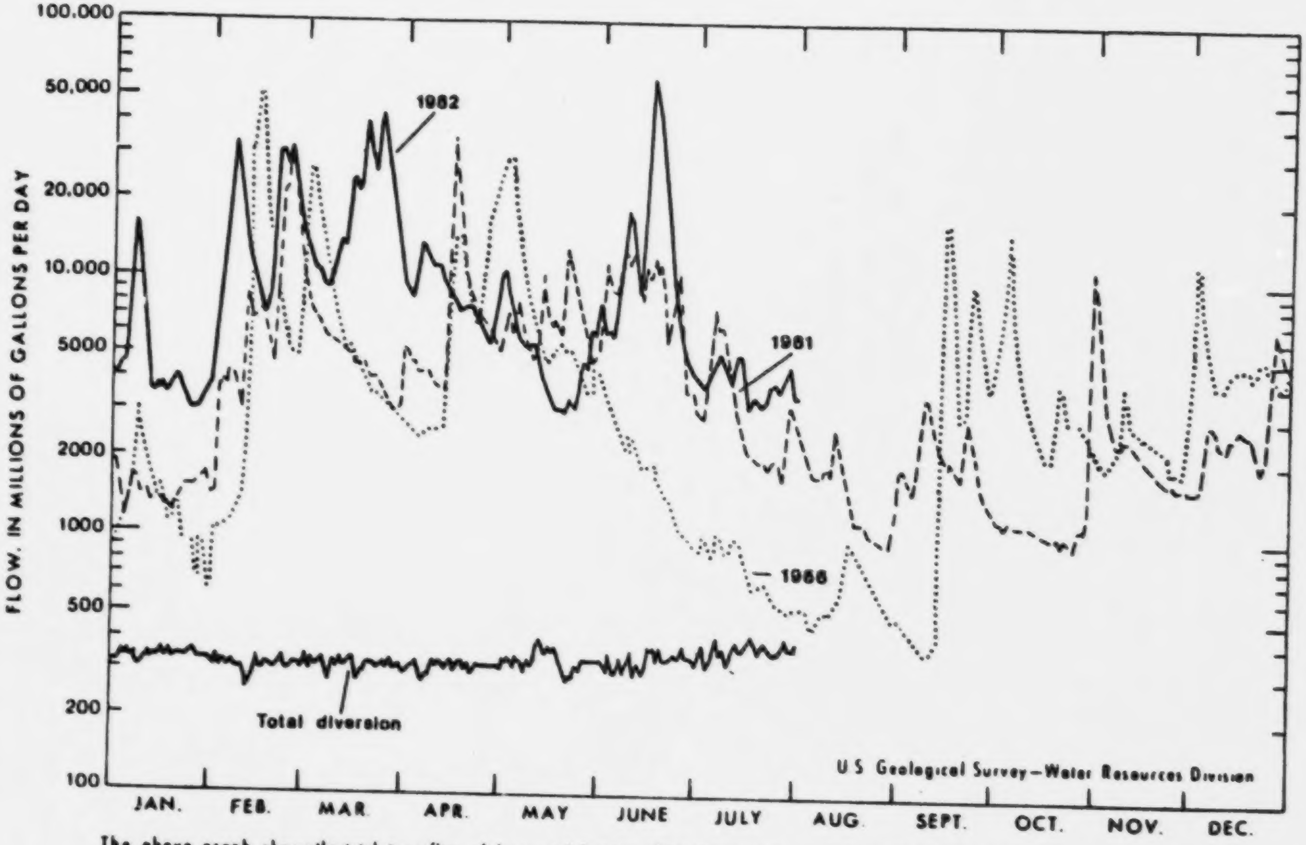
The following figures set the stage for the problem. When I talk about the Washington metropolitan region, I am also talking about Prince George's and Montgomery County in Maryland--about 1.2 million people served by one agency, the Washington Suburban Sanitary Commission; the District of Columbia, served by the Washington Aqueduct; and Fairfax County, served by Fairfax County Water Authority. There are other smaller communities, but they are served by one of these three. So we are talking about three independent water supply agencies.

The primary source for the water is the Potomac River. In the case of Washington Suburban Sanitary Commission, we have two small reservoirs on the Patuxent River that provide about a third of our water. Fairfax County, until this year, got all of its water from the Occoquan Reservoir and only this year has started withdrawals from the Potomac. The District of Columbia has no other source than the Potomac, and it has no reservoirs. These three suppliers are dependent on the Potomac River as a source of water.

Figure 1 shows the problems of depending on the Potomac. Normally, the flow is very high, very generous amounts of water, over a billion gallons a day. But notice the 1966 drought. By the year 2000 we will be needing between 600 and 700 million gallons per day out of the Potomac, so we are facing severe shortages. A repeat of the 1966 drought, which is certainly a possibility, would create a very, very serious water shortage in this region.

This is not a new problem. As I said, we have been working on it for 20 years. Because this region is the nation's capital, Congress has had a very keen interest in water supply for this region for a long time--since 1850, when it authorized the Corps of Engineers to construct the Washington Aqueduct to provide all the "sweet water the nation's capital ever needed", and to this day the Corps still operates it, even with home rule under the District.

Therefore, for about 20 years the Congress and the Corps have worked on this problem, looking for a federal resolution of the



The above graph shows the total streamflow of the non-tidal portion of the Potomac River and the total of diversions for water supply in the Washington metropolitan area. Total river flows for 1981 and for a portion of 1966 are included for comparison with current conditions.

The difference between river flow and total diversions represents the inflow to the head of the Potomac Estuary. Sediment discharge from the Potomac River basin above Washington was approximately 19,840 tons during July.

This report is issued monthly except during low-flow periods when more frequent release of information is justified for appraisal of water-supply conditions.

7/30/82

FIGURE 1 Potomac River water supply near Washington, D.C. (1982)

problem, again, I believe, because of congressional interest. In 1962 (Table 1), one reservoir that is in existence now--Bloomington--was authorized, but as part of the Appalachian Redevelopment Program; however, it was authorized and got started and we are thankful for it. But in 1963, the Corps made a study of the total Potomac showing that 16 reservoirs were needed for water supply, water quality, and flood control. Six years later, the chief of engineers said that 6 of those were urgently needed for water supply. A year later, the secretary of the Army agreed that two of those reservoirs were really urgently needed because we were getting close ("we must build them"). In 1974, Congress did authorize these two reservoirs. Congress also authorized the construction of a pilot treatment plant at the Potomac estuary to conduct tests to determine whether water could be used out of the estuary as safe drinking water instead of from these two reservoirs, and it also authorized one last study of the Washington metropolitan area water supply. This turned out to be a very important study, as I will explain later.

So what was accomplished in 20 years of effort? We did have Bloomington, which after almost 20 years was put into operation. We had the pilot treatment plant, which does not provide a drop of water. It is a good research project and the research is under way. The Corps published an interim report about the water supply study that, as I will explain later, was very important, but Sixes Bridge and Verona have been killed by local opposition. Thus, 20 years later, we did not have any more water, and the problem is becoming more urgent. But we had formed the Metropolitan Water Supply Task Force to say that we in the region would try to solve our own problem.

Hindsight is always good. Why had we not got where we wanted to be in 20 years (Table 2)? I think, first because the local jurisdictions had actually given up their responsibility and passed it to the federal government, requesting it to solve their problem. Therefore, there was no constituency. The large reservoirs that were proposed for the region were opposed, and from the beginning, objections made them dubious. Also, the sizes of the reservoirs were based on the very conventional thinking of "Let's provide all the water we need for the worst day in the worst drought." Plenty of yield. As a result, the reservoirs were not only too large, with respect to environmental impact, but also too expensive. In hindsight we realized that the traditional Corps planning process was never designed for water supply. The process is designed to weed out projects, not build them, but we had been relying on it.

Things happened, though. Starting in 1978, a series of events occurred that led to the resolution (Table 3). First, the two counties--Prince George's and Montgomery--and Washington Suburban Sanitary Commission got a little exasperated with all of this planning and no water supply and decided to create a bi-county water supply task force to see if they could not solve the problem within their boundaries. The task force and the way it was organized became very important. In the first place, the task force, the people making the decisions, consisted of elected officials. The presidents of the two councils were the chairmen. Second, there was a citizens' advisory

TABLE 1 Corps Activities

1962	Bloomington Reservoir authorized
1963	Corps district engineer recommends 16 reservoirs
1969	Chief of engineers recommends 6 of the 16
1970	Secretary of the Army recommends 2 of the 6 Sixes Bridge, Md. Verona, Va.
1974	Congress authorizes Sixes Bridge, Md. Verona, Va. Pilot estuary plant A new final all-purpose Washington metropolitan water supply study

TABLE 2 Reasons for Lack of Resolution By 1981

A. Local jurisdictions were not seriously involved in the studies and, in essence, delegated the problem to others, i.e., the Corps.

B. The solutions proposed were large reservoirs far from the District of Columbia, and the local objections made construction dubious.

C. The size of the reservoirs was based on a very conventional safe approach to water supply planning, and to many the resultant reservoirs were too large and too expensive.

D. The Corps' congressional planning process is deliberately slow (the average project takes 20 years to complete).

TABLE 3 Bi-County Water Supply Task Force

Prince George's, Montgomery, WSSC

A. Political leadership
B. Citizen's advisory committee (CAC)
C. Technical support

Accepted: Risk (drought) management
Recommended: Little Seneca Reservoir

Corps Washington Metropolitan Water Study

Local option
Little Seneca plus interconnect
  Potomac/Occoquan or Patuxent

Corps' Federal Interstate Regional Advisory Committee for Metropolitan Study (FISRAC)

Fall of 1979:

A. Solution is local
B. Form Metropolitan Water Supply Task Force
C. WSSC organize

Washington Metropolitan Water Supply Task Force

Formed in January 1980
Political leadership (PG, MC, DC, Fairfax)
CAC--12 (3 for each jurisdiction)
Technical--WAD, FCWA, WSSC

committee. This was not a rubber stamp citizens' advisory committee; its members were willing to do their homework and insisted that the task force look at this creatively. Third, the task force had the technical support of Washington Suburban Sanitary Commission and good consultants.

The task force recommended what John Boland talked about this morning, namely, drought management and better management of water. Its recommendations were adopted. This is a very brief summary. A drought management plan with three stages (I, II, and III) was developed, each stage being a more severe restriction to manage water (Tables 4 and 5). During stage I, use of outside water is restricted. During stage II, air conditioning usage is restricted and swimming pools are closed down. During stage III, consisting of steps III A, III B, and III C, the restrictions become even more severe. The task force next decided what risk it was willing to accept and what it wanted to plan for. It decided to accept scenario A from Table 4. Basically, the commission will accept an 8 percent probability that in any given year stage I (restricting the use of outside water) will have to be implemented for less than 30 days and a 5 percent probability that it will have to be implemented for more than 30 days. The probability for implementation of stage II was determined to be fairly low (3 percent), and that for stage III was considered almost unlikely. The impact of that, though, I think is the important thing. By adopting that kind of analysis the task force reduced the storage requirements by the year 2000 from 3,400 to 1,300 (Table 5). About one-third of the storage is needed (one-third of the additional water) if you are willing to take this risk. Remember, political officials are going to have to defend this risk and take the heat if the public does not like restrictions when they are imposed. The elected officials did adopt drought management.

To implement the planning, the Bi-County Water Supply Task Force selected a small reservoir, the Little Seneca Reservoir. It can meet Washington Suburban Sanitary Commission's needs to 2005. All local approvals were obtained, and Washington Suburban Sanitary Commission started getting the permits, started design, and was prepared to build and finance it itself. About the same time that the Bi-County Water Supply Task Force finished, the Corps issued an interim report on water supply. This interim report was designed, based on the localities' request, to determine what could be done within the region.

The Corps found that building Little Seneca plus a pipeline that would connect the Potomac River to either the Occoquan or the Patuxent reservoir would provide enough water to meet the needs within the region. So for the first time, instead of looking at dams outside our boundaries, we were looking within. It was now a local decision.

At a meeting to review the Corps' conclusions, Washington Suburban Sanitary Commission suggested that since the task force concept had worked so well to resolve the Maryland portion of the region's problem, a Metropolitan Water Supply Task Force be formed. In December 1980, the general manager of Washington Suburban Sanitary Commission wrote to the presidents of the councils of the District of Columbia, Fairfax County, Montgomery County, and Prince George's

TABLE 4 Scenarios, Storage Requirements, and Maximum Day Deficits for Bi-County Area Only

Period of Implementation Expected to Last

Scenario A

	30 days	30 days
Stage I	8%	5%
II	3%	2%
III-A	1%	1%
III-B	1%	1%
III-C	1%	1%

	1985	1995	2005
Storage requirement (mg)	0	850	1,320
Maximum deficit (mgd)	0	76	101

Scenario B

Stage I	20%	17%
II	10%	5%
III-A	1%	1%
III-B	1%	1%
III-C	1%	1%

Storage requirement (mg)	0	430	740
Maximum deficit (mgd)	0	29	52

For purposes of calculating storage requirements implied by these scenarios, it is assumed 1 out of every 2 stage I actions will be false alarms for periods less than 30 days and 2 out of 5 stage I actions will be false alarms for periods greater than 30 days; and 3 out of every 20 stage II actions will be false alarms for periods less than 30 days and 1 out of 20 stage II actions will be false alarms for periods greater than 30 days.

TABLE 5 Drought Scenarios, Stored Water Requirements, and Maximum Deficits

Year	Maximum Stored Water Requirements (million gallons)	Maximum Daily Deficit
Scenario A		
1985	0	0
1995	850	76
2005	1,320	101
Scenario B		
1985	0	0
1995	430	29
2005	740	52
Scenario C		
1985	250	44
1995	2,250	119
2005	3,400	142

NOTE: A supplemental water supply with the stored water availability shown and the maximum daily capability shown would be sufficient to prevent water supply failure resulting from any deficit having a probability of occurrence of 0.01 or greater, provided that drought management measures are implemented as provided in the Drought Contingency Plan. See Table 4 for a description of the scenarios.

County and asked them to form the Washington Metropolitan Water Supply Task Force. They agreed. The task force formed in January 1981 used the Bi-County Water Supply Task Force as a model. The task force members are the four council presidents; a citizens advisory committee was formed immediately; and the three water supply agencies provided the necessary technical analysis.

There are twelve people on the citizens advisory committee--three from each of the jurisdictions. The three water agencies decided to provide the technical service because they felt that there were enough studies and that they did not need to reinvent the wheel.

The first effort of the task force was the analysis of supply and demand. The Task Force Technical Group (the three water supply agencies) used nontraditional, innovative analysis.

Fortunately, six months before the task force was formed, the three water supply agencies had agreed to work with the Interstate Commission on the Potomac River Basin (ICPRB) and create a computer model of the Potomac River drought flows. To build this model, the agencies gathered the best weather data available, used the best weather prediction capability from the National Weather Service, and incorporated the latest U.S. Geological Survey river forecasting technqiues into the model. The model was available when the technical group started analyzing supply and demand.

The technical group tried to incorporate regional dam projects into the model to analyze availability of water versus demand, but soon a major deficiency was discovered. Demand projections used in previous studies were on a monthly basis. Unfortunately, water utilities do not operate on a monthly basis but on a day-to-day basis, and the flows vary daily. By using some simple arithmetic and some very complicated math it was possible to convert demand projects for the years 2000 and 2030 into day demands. With this tool, river flows could now be matched on a daily basis with projected demands on a daily basis, which is far more realistic for utility needs.

The technical group then analyzed the water demand and supply for the region without regard to ownership for any given storage facility--a regional operating plan. With the great assistance of Dr. Daniel Sheer from ICPRB, the group developed regional daily operating scenarios for periods of drought and found that if all the facilities were operated as a system, there would be enough water to meet the region's needs through the year 2030. (It should be remembered that at one time two additional large reservoirs were believed to be necessary. Later, the Corps, in the interim report, had recommended an expensive pipeline from the Potomac to a local reservoir, and we now find that neither the large dams nor the pipeline was necessary.) The reason that regional operation is so effective is the distance of Bloomington Reservoir from the Washington metropolitan region. Flows released from Bloomington take four to five days to reach Washington. If too much water is released, then it is actually wasted and goes into the estuary. If the three local reservoirs--the Occoquan, belonging to Fairfax; the Patuxent, belonging to Washington Suburban Sanitary Commission, and Little Seneca, about to be built by Washington Suburban Sanitary Commission, are included in the system, then far more conservative releases from Bloomington (based on the computer model) are possible and water is not wasted. In essence, the three local reservoirs are shared to make water available for everyone. Without a good model to project demands on a daily basis, which is the way utilities operate, such a system concept would not be possible. A modern tool and an innovative regional thinking saved millions and met the region's needs.

The technical group then advised the task force of their findings and recommended a regional system. The group advised that it was not necessary to build the pipeline the Corps had recommended, and that only Little Seneca was needed provided that cost-sharing and regional operating agreements could be worked out. The task force agreed that it should be a regional system (a major regional breakthrough). So, the technical group went about working out the details. The details took almost a year because of what had to be done. Cost-sharing arrangements had to be worked out, as well as a regional operating plan that would consider all of the following: How much does Washington Suburban Sanitary Commission take from the Patuxent Reservoir versus the upper Potomac River? How much does Virginia withdraw from the Potomac versus the Occoquan Reservoir? Since Washington Aqueduct (D.C.) can only withdraw from the Potomac, the plan must insure that Washington Suburban Sanitary Commission and Fairfax do not take too much out, etc.

Also, one federal/interstate agreement had to be modified, the Potomac River low-flow agreement. We had had some regional cooperation in case there was not enough water in the Potomac. A plan to allocate Potomac flows so that each jurisdiction then got a certain share had been signed. It had to be modified. In addition,there are issues relating to repayment for Bloomington that have to be solved. In 1962, when Bloomington was authorized, before it could be built, someone had to agree to repay the cost for the water supply. You have to pay the federal government back for water supply reservoirs. Maryland had created a water authority to repay the cost of Bloomington. That authority had to be dissolved and the obligation transferred to the three water agencies.

The issue that almost killed the planning was the Savage Reservoir, which is a Potomac Reservoir not for water supply. The Savage Reservoir was built many years ago in Allegheny County, Maryland, for the purpose of diluting the wastewater from the paper mills in Luke, Maryland--the West Vapco Paper Mills. For permission to build it, Allegheny County, Maryland, agreed the Corps would control the releases. The paper mills in Luke have cleaned up, and they no longer need Savage for dilution, but Allegheny was stuck with the operating and maintenance costs. The Corps must release water from Savage that is not acidic, along with the acidic water supply releases from Bloomington, to dilute them to meet state standards. Allegheny County would be paying O&M for a use that was of no benefit to them. So we had to figure out how to correct this. Basically what we did was work out a cost-sharing agreement for Savage O&M. Fairfax, Washington Aqueduct, and Washington Suburban Sanitary Commission will share the O&M cost with Allegheny County.

For Little Seneca Reservoir which Washington Suburban Sanitary Commission was planning to build, instead of all the cost, the commission will pay 50 percent and Washington Aqueduct and Fairfax will pick up the other 50 percent. The regional operating plan is the computer model that had been prepared for our study and turned into a contract. The low-flow agreement, after many months of argument, was modified to include cost sharing if we ever need to build anything else.

Finally, there were eight contracts. They were signed on July 22, 1982. The only thing remaining to be done was to build Little Seneca Reservoir. We opened bids in August of 1982, and it is under construction.

In looking back and thinking why that did succeed after 20 years (Table 6), I think, first, that the leaders of the three water utilities finally realized that the efforts of the Corps that we had backed, as well as the efforts of the Congress, though sincere, were not going to solve the problem. Elected officials rather than the utility leaders were the decision makers, and they participated in the studies from the start to the finish.

I cannot emphasize point C in Table 6 too much. In both instances we had strong citizens' involvement in every step of the planning process and obtained their concurrence on each decision. This also was our constituency to support us when things started falling apart. For example, during negotiation of those agreements, there were times when we were not getting very close. I did not hesitate to ask these citizens to call their elected officials and have them tell those guys to get back and work harder because we wanted it resolved.

Point D in the table is equally important. We abandoned the traditional planning concepts. Remember that at one time we needed 16 reservoirs. I was district engineer when I went out and gave speeches about how you better build Verona and Sixes Bridge right away or else you are going to run out of water. Now I am saying that a very small reservoir in Montgomery County, by itself, will solve the problem. We looked at innovative systems analysis and the benefits of regionalization. Thanks in many instances to our citizens' involvement, we accepted many of the concepts John Boland talked about this morning on risk management.

Last, I guess that it really did succeed because there were a few individuals who were, I think the word is, obsessed to push this through. It was a very difficult process, there were many setbacks along the way, and at times there was certainly every indication that we would have to give up. But we kept on, and I recall, at one point, toward the end of the work on the agreements, we had 11 lawyers going over them word by word. Well, if it had been left to them, they would have met periodically and would still be meeting. But they were not allowed to leave until they had reached a solution that day. That takes dedication.

But I think that with citizens' involvement, creative thinking, and leadership, the benefits of regionalization have certainly come to Washington, D.C., and we have solved a problem that has been plaguing

TABLE 6 Reasons For Successful Cooperation

A. The leaders of the three water supply agencies finally realized that the efforts of Congress and the Corps, though sincere, would not resolve the issue.

B. Elected officials who were eventually responsible for the solution were asked to form the two task forces, and it was they who made the decisions and recommendations in lieu of the utilities.

C. Citizen leaders were involved from the beginning and concurred in every decision.

D. Traditional planning concepts were abandoned and replaced by innovative thinking and incorporated the important concepts of risk management and regional system-wide operation.

E. There was a dedication on the part of several individuals involved in leadership roles to resolve the issue, and they persisted in spite of what, at times, seemed to be insurmountable technical, legal, or political obstacles. Perhaps this dedication to solve the issue is the most important factor.

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us for 20 years. We have enough water for the next 50 years and an agreement on what to do if we ever need more.

GENERAL DISCUSSION

QUESTION: Bob, could you explain more about your risk assessment at the very beginning--scheme A and scheme B? That was an important decision, and I did not understand what you did there.

MR. McGARRY: We developed a drought management plan. What do you do if you do not have enough water? Stage I, you restrict outside use. Stage III C, you are closing businesses down, and there are stages in between. Then we acknowledged that river flows are a probability. Then we developed a scenario for the water needed with an 8 percent probability that you will have to go to stage I for less than 30 days, and a 5 percent stage I for more than 30 days, and a less than 1 percent probability of ever going into stage III. Several other scenarios were considered, for example, scenario B accepts a 20 percent probability of stage I.

QUESTION: Is that 8 percent probable each year or 8 percent probable in 100 years?

MR. McGARRY: Eight times in 100 years, or 8 percent in any year.

QUESTION: Well, what I was thinking was that droughts tend to appear infrequently. Won't they bunch up on you?

MR. McGARRY: Well, so far we have not been convinced about the bunching. We believe that droughts are random events. Yes, history does show that there were a couple of years in a row that you have your problems, so you could have bunching.

DR. MARKS: Were you testing against the historic record to some extent or a synthetic record?

MR. McGARRY: The historic record.

DR. MARKS: So you are simulating this within a historic record?

MR. McGARRY: And the flows in the river.

QUESTION: Are you testing it against the worst condition ever recorded--the worst drought?

MR. McGARRY: We have taken the entire record and say that there is an 8 percent probability that you will have this much water in any given year. Now, the fact that we did not have a drought last summer does not mean a thing this summer. There are some who are writing papers saying that if you had one last summer, you are going to have one this summer.

For example, take the Wilkes-Barre flood and try to explain to the people of Wilkes-Barre why they had two 200-year floods in 3 years. I said to them, "you are unlucky." You could have 8 or 10 of these in a row and then go 92 years without one, if you are just very unlucky, because the fact that you had a 100 year flood last year does not mean you will not get another for 99 years.

QUESTION: But that still is only for a 30-day period in each one of those--just one month.

MR. McGARRY: Yes. We looked at it two ways. We felt that a drought, outside restrictions for more than 30 days, is more severe to the community than less than 30 days, so we looked at both situations. If you go to this really high risk of 52 million gallons per day, as we pointed out, that really translates into less storage. If you are willing to accept that risk, our recommendation would have been that you do nothing. But if your recommendation is that you want less than 1 percent probability of restrictions so people will always be able to water their lawns, you need more than three times as much storage.

QUESTION: I agree with that concept, and I think we have got to move in that direction in the Bay Area, and we are going to do it, not just individually but collectively, even if some of the utilities do not like it. But what concerns me is that your elected officials who meet now with the citizens' committee and others make a judgment regarding the degree of risk they are willing to take, and they talk about 30 days and an 8 percent deficiency, and they do that based on a balance of cost and their feeling about what the risks are and all of that.

My concern is that while that decision can be made differently each year, with a different set of elected officials or citizens' representatives, water management facilities are built in 10-, 20-, 30-, 40-year increments. So if you get a reversal of that policy in 10 years, say, based on 5 back-to-back 8 percent years, then you cannot remedy that within a short frame. You cannot go out and build another one of the alternatives without waiting 10 years to get the beneficial effect of it.

That is the only concern, and I suppose it is better to have a sensitive system than it is to have a nonsensitive one, but that is a risk you take.

MR. McGARRY: One other thing I would say in guidance is if you are going to set up one of these task forces, you have from one election to the next to succeed, all the way through to approval. One of the major concerns this past summer was, I felt, that we absolutely had to get it approved before we went into the primaries for the two county councils that will have to give their blessing, because if we had had a reelection and change of scene, we would have had started all over. So you have a very short half-life for doing it.

QUESTION: There are a couple of points, I think, about the difference between California and New Hampshire and the experience here, one in terms of developing the demand. I can remember when John Boland came into the citizens' meetings and we talked about the fact that we had always heard that the peak day was about 500 million gallons a day, that we had always used water. We knew we would use that much and that the lowest flow in the river was 400 million gallons per day or so, and we knew we had a deficit. And after the consultants looked at it very closely and correlated, they said, "Well, wait a minute." A deficit always occurs in the late fall, and you would know by spring by your rainfall patterns what the late fall would give you.

That does not have to mean, then, that you would have that. As I thought about the projections in California, I wondered if that kind of thinking was being built in. What is your real need, and do you have the capability with the snows, et cetera, and the way that you manage it to forecast ahead of time long enough to initiate some of these kinds of scenarios we have talked about?

The other thing that came about in terms of the New Hampshire case--one of the real impediments, it seemed to me, in reaching agreements before was dealing with raw water, dealing with the problem of the inflow streams. The one proposal that really got this off the ground was the fact that there was talk about transferring the high flow raw water from the Potomac into the Patuxent Reservoirs, which are relatively clean, and the high flow of the Potomac is dirty as can be.

My thought was that it is maybe easier as we deal with some of these regional connections if we think in terms of the finished water concept of transfer and interconnection versus the raw water problems, because of the connections it brought in.

The final remark I want to make concerns these dedicated people Bob McGarry talked about. He may perhaps be the most dedicated of the entire group. I think if Bob McGarry had dropped dead someplace in the process, we would still be wrangling. However, he had the stick-to-itiveness to say, "We will set a meeting next week. By next week, would you have available for us ..." and so forth. I mean, it is not the case that you can get 11 attorneys in a room. You have to get them in a room and force them to make a decision and, if they cannot make it, force them to set a meeting where they can make it. So there is a lot of shepherding that he should take a great deal of credit for.

MR. McGARRY: One of the reasons that gave me a lot of credibility was that we had solved our own (Washington Suburban Sanitary Commission) problem and therefore did not need Fairfax and D.C.. So when we decided to look at it regionally, that was the reason they asked us to form it.

QUESTION: Bob, did one of those scenarios you showed show the risk that you ultimately accepted or settled on?

MR. McGARRY: We accepted scenario A. I did not emphasize enough the modeling that helped with all of this. The released water from Bloomington takes four to seven days to get to the D.C. area where we need it. The modeling that put all of that together using these reservoirs really was almost the equivalent of building another reservoir. So that technique, as well as drought management, is very important.

What we found is that if you are releasing water here and it takes seven days to get to D. C., if you overestimate the amount, the water goes by and is wasted. But if you have a small reservoir in

Montgomery County, then you can make more conservative estimates, releases here, based on your prediction, and then if you are wrong, you can make a quick release there.

So this little reservoir here is probably equivalent, with a systems type of approach, to having one bigger one up there.

QUESTION: Bob, you mentioned the drought exercise. As long as we have these people here, I wonder if you could describe that particularly, and I wonder if anyone else has ever heard of anything like that being done?

MR. McGARRY: Well, what we are doing is taking a recorded drought. I think the one we are using is the 1933 drought, and we are pretending that it is going on right now and we are using our current demand, which in the 1933 drought would cause some problems. So each day we tell the utilities what the flows are and where and how much water they have. Initially, the exercise business went on as usual. But now we are in the real severe drought of 1933. We've had to make some simulated releases from Bloomington, and we are telling Washington Suburban Sanitary Commission what share of the Potomac it can use for the next four days to insure that Washington Aqueduct has enough. Likewise, Fairfax is being told to use the Occoquan. We will go through a daily allocation until the drought is over.

One of the things that have occurred already is that we have some accounting problems with the Corps and Bloomington water because part of it is for water quality. The balance is for water storage, and we are not sure we know how to account for it during this drought, but having done it on paper, we will go back and solve it. It is exercising the system.

Now, the citizens' involvement is important because engineers in the past have decided what kind of risks people are willing to take. With the high cost of money reflected in what they build, there are going to be people who are more anxious to play a role in this. So what we are doing is redefining what ought to be the safe yield. Instead of 95 percent or 99 percent, now we're talking about 92 percent. That means a considerable change in the capital cost, which today, at the high cost of money, is a much more significant factor than it was 10 or 15 years ago. So this I think is what engineers have to begin to consider, and this is why the participation of those to be served becomes so important, because it is they who are going to have to spend the money for protection at all costs, which is 1 percent versus an 8 percent.

One of the things that was very helpful was citizens' involvement. They questioned everything. Who says it's 100 gallons per person per day? They even demanded a part in looking at the consultants who would perform the study, because there was skepticism that certain consultants were so traditional that it didn't matter. They'll pull out an old study, they put a new heading on it, a new date, and they run it right to the agency. That was quite an interesting battle, in which the citizens fought for a consultant that they did not get, but the consultant they got was so much better than what you would have gotten if you hadn't fought for the other one. There was an awful lot of interplay, but it did go to the heart of the challenge.

QUESTION: Certainly the principle is indeed correct, and utility systems have been designed for some risks. I mean, for instance, every time we get a busy signal on a trunk line when we try to dial somebody across country or across town, the system's overloaded. It is the same thing, a shortage of supply.

But we've got to be careful and adopt a solution that is good for the region, not one that is good nationally; it obviously won't work nationally. In our area in Texas, when we have drought, it's seven years, an unrelenting seven years. You're not talking about losing your azaleas; you're talking about losing your house, your trees, everything. You know, the houses are built on expansive clay, and if you don't water the foundation, the house will crumble, things like that. So you've got to look at all the different situations.

MR. McGARRY: I think that if your water record shows long droughts, your probabilities would come out the same as ours. We were looking at a more abundant water supply. But I do think you could--rather than zero risk or less than 1 percent, there is a risk you can take, and it does have an impact.

QUESTION: Our citizens, once you've gone through one of those and you do have a shortage, said, "We don't care if you double our rates, we just want the water." So citizens will speak with one voice when they have money and another voice when they don't have enough, maybe. So you have to be careful.

DR. MARKS: I think it is an issue of trying to quantify what the risk is, and it's a question of would it stand up with the next set of officials. I think by quantifying and presenting it in that way you have a pretty good chance that it might stand up.

MR. McGARRY: I don't want to pass on that, because if we hadn't agreed it was reasonable we would have fought like hell and not adopted it. That's why all three--utilities, citizens' advisory committee, and elected officials--must be in agreement. The overall point I was trying to make is that the utility managers have got to drive it, and you've got to look around: What is my political mechanism to get there? You don't want to give up, but you've got to move fast. If you've got a drought in 1966, you don't have 10 years to solve it. My theory is that you've got about the life of one term of office, if that is the route you choose to go, because a change of elected officials could just blow you out of the water.

QUESTION: Well, I'm only going to speak for Kansas at this point. In Kansas the answer is yes. We've got 300 million gallons a day of water in storage, unsold, for a 2 percent chance drought. But we also sold some of it. That is state-owned water and a state source.

I like your solution here, but it wouldn't necessarily play that well in Peoria or Paducah.

QUESTION: Standing back from the solution and seeing it in the context of a big infrastructure, $3 trillion or so, is this an example of a community service adopting a lower standard of service, not 2 percent but 8 percent, with cost savings? Is this how we're going to adjust? In other words, instead of avoiding the cost that everyone has in these trillions of dollars, are we going to cut them out some way and accept a lower standard? Now, we may think this is a rational choice to make, and I'm very much convinced of this. However, it's an interesting example of a working of community forces, which is saying that you can't have 2 percent risk any more, it is too expensive, we're going to back off and have a cheaper one, and that is one way we're going to adjust to the overall problem.

DR. MARKS: Our next speakers are going to have to follow three very good and very dynamic speakers, who really, I think, exemplify the Okun theory on the need for leadership. And in fact, the purpose of this next section is to bring a different viewpoint.

We are bringing in two state people, Jim Pluntze from Washington, and Paul Arbesman from New Jersey, and two federal people, who are going to have to wrestle with the financing game, the regulatory game, and the small systems game. It is a very different issue than the exciting concepts and the issues that were brought up in the individual systems.

What happens when you have small systems and you really don't know what is going on there? How does one look at financing in a creative sense? So it brings us back into another set of issues. First let me introduce Jim Pluntze from the state of Washington.

Biography

JAMES C. PLUNTZE

JAMES C. PLUNTZE has been director of water supplies for the state of Washington since 1966, with prior experience as district engineer for the Washington State Department of Health. He holds a B.S. in civil engineering and an M.S. in sanitary engineering from the University of Washington.

STATE PERSPECTIVE CONCERNING COOPERATION IN URBAN WATER MANAGEMENT

James C. Pluntze
Department of Social and Health Services
Olympia, Washington

It is hard to know where to begin in talking about cooperation in urban water management. I will try to give you the state perspective. I will be talking mostly about small systems, at least in the sense that the term has been used at this meeting.

We have at least one large system, the city of Seattle, which is a regional purveyor. We have seen them go through some of the trials and tribulations that I've heard here today, trying to deal with their wholesale customers and gradually instituting some measure of joint cooperative planning in rate setting as well as on areawide issues. That process has not been without its difficulties.

There is no need to remind you, I guess, that there are 220,000 public water systems in the nation. Washington State has some 4,000 of those--more than its share, I would suspect. By comparison, we have four natural gas utilities, 25 telephone utilities, 50 electric utilities, and perhaps as many as 500 sewer utilities. We have 4,000 public water systems and, in fact, another 4,000 that the Environmental Protection Agency (EPA) ignores, but which we as a state health agency cannot ignore--so some measure between 4,000 and 8,000. Well, it is not a very intelligent way to manage a delivery system for drinking water, obviously. On the other hand, we have got them there. They have been there for some time. Most of the people are satisfied with them. So what do you do?

Well, that is where you need to be innovative and creative, somebody said. We think we have at least cracked the nut, if we have not broken it. I have some data in my paper on compliance, which I will not bother to go through. The EPA compliance figures are probably accurate as far as they go, but they do not necessarily tell you the whole story. And we have seen the General Accounting Office come around this last year critiquing those figures and saying that the Safe Drinking Water Act is not doing very well, because we have thousands of systems that do not meet the standards.

The fact that they do not meet the standards is certainly a problem. Nobody pretends that it is not. I think the states are aware of that and are dealing with it. One difficulty is that the Interim Primary Drinking Water Regulations do not tell you how well the system is really doing. They tell you when the system is failing. They do not tell you much more about it. The standards do not address facilities on operation. And without those two key elements, you do not have anything, at least that is our view. Whether you meet the standards or not, you really have no confidence in that system. So we are really talking about a problem that in a sense is beyond and more than what is seen by simply looking at the EPA compliance figures.

When I was reading the papers in the meeting notebook last evening, I came across Dan Okun's article in the American Water Works Association Journal a year ago. Apparently Dan must have served on the regionalization committee, because its report said about the same things. The former chairman of that committee used to work in our agency and developed most of the strategies that we are now using in terms of regionalization. We have state legislation and an active program that involves at least two full-time positions out of a total of 35 or so in the program.

If you want to know how it works, you can read my discussion here or Dan Okun's, or maybe both. We think it works because it is a bottoms-up kind of system.

The first thing you do is find a water system or group of systems with an awareness of the problem. If they do not perceive a problem, then you have got another step, because you have to educate them and make them aware.

And I guess the "warm puppies" syndrome is not going to work until somehow the temperature goes down. I see that as one role of the state, to lower the thermostat. And we can do that through an active enforcement of the standards, not only water quality standards but also the proper facilities and operation that goes with it.

It is true, you cannot expect quite as much of a small system as you can of a big system. I happen to live on a system that serves 20 houses, and I know what a system like that is. It is a well and a pressure tank, and the developer put it in, and it is okay for what we need.

People bought in there, as I did, knowing that there was no fire protection and only one source of supply. If the well or the pump failed, you were out of water for a while. People inherently accept those kinds of limitations on a small system. We really should not get too excited about those systems if they meet some minimum standards. Our regionalization approach is intended to find an area where there is a proliferation of systems, where there are problems of source, storage, and distribution, or where in some way, there is some obvious need for some banding together. And we have found a number of those in Washington.

We find that once you get people together, after a few meetings they find that they do have some common interests and maybe some common problems, and if they would go together--whether it is interconnection, combined operation, contracts, whatever it might be--maybe they would save money in the long run.

We have found that the state is an essential ingredient to start that process. If the big utility goes out and tries to do that, immediately it is suspect. What are they after, what are they trying to do to us? The small systems normally do not have the time and the personnel to instigate and initiate that kind of process. We find that the state can fill that gap. We are a disinterested party. We come out there with the attitude of not caring how they do it. We do ask that they meet certain standards of operation, but whether they want to do it separately or jointly is up to them. In a nutshell, you involve local people. We form a coordinating committee, and we then try to stand back and let them go with it. If you can find good leadership to take charge, then you are way ahead, and we can just go on to the next place.

One advantage we have in Washington over some states is a state-funded financial assistance program that was started in 1973. To date, we have spent close to $100 million of state dollars on 40 percent matching grants for construction of some 600 public water system improvements. Initially, this program served to sweeten the pot. It was a way to provide some incentive for regionalization to move forward. It has been very helpful in that regard, and also for the basket case system where everybody's sitting around looking at each other and nobody has any way to attack the problem.

I have some conclusions in the paper, and I think they are pretty self-evident. It is a lot easier to prevent new systems from starting than it is to get rid of them once they are started. In our case, if we can arrive at the year 1990 in the state of Washington with only 4,000 public water systems, we will be way ahead. That will be enormous progress, because if we do not do something, we will have 6,000 or 10,000, and that is not what we want. I think we as professionals know that 4,000 water systems is too many. It is not reasonable, it is not rational, and it is not efficient. But the first step is to reverse the trend.

Concerning regionalization, you have got to have a long-range look. You are not going to have a one-year or even a five-year payback, probably. It takes a long time to get people to build those relationships. Again, it has been said before and I think it will be said again, but the problems are mainly people problems, not really technical problems. Those are the tough ones to deal with.

GENERAL DISCUSSION

QUESTION: You mentioned that water system in your home. Could someone build another one like that?

MR. PLUNTZE: Oh, yes. They're being built every day.

QUESTION: You're not considering that?

MR. PLUNTZE: I didn't go through the system in detail, but once the coordinated area is developed and the utilities go through their planning process, each one by itself, and come up with a coordinated plan identifying each service area that people want, we have a mediating role there to try to adjust conflicts as they arise.

Only then can we say to somebody that we are a health agency. We have no other authority. We can say, "No, you are in service area A, you have to buy water from them, or at least build the system to their standards. You may not put in a new system." But we are really not at that point yet.

QUESTION: Holiday Acres is in a very water-rich area, I presume, near Olympia?

MR. PLUNTZE: That's right.

QUESTION: Do you notice a different behavior or a different approach to these problems in eastern Washington as compared with western Washington?

MR. PLUNTZE: The people are the same. It is simply that instead of drilling a hole 80 feet deep, you've got to go 300 feet. But generally, water is too readily available in Washington. That is why there are 4,000 systems. In some states it isn't quite that way, and they don't have as many.

QUESTION: What portion of the state is covered by some of the supply areas?

MR. PLUNTZE: We have a dozen or so areas that are in various stages of moving through the process, and some of them have gotten as far as having a coordinated plan with service areas developed. I don't know that we have gotten to the point yet of actually saying to anybody, no, you cannot put in a new water system, but we are about at that point.

QUESTION: Is the financial assistance program trying to achieve some overall state priorities? How do they decide how to allocate it?

MR. PLUNTZE: Well, the legislation in that case was passed in 1973. We were a little better off then than we are now, and the only guidance (was part of a package of six measures that the Governor sponsored) was called "Washington Futures: To Build Today for the Needs of Tomorrow," kind of a reverse of the book American in Ruins. But the legislature simply told us to take this money and go out and improve the state's drinking water systems, which we had told them needed improvement. And goodness knows it did, and it still does to some extent.

But we have built a lot of filter plants in Washington. We have gotten rid of most of our uncovered reservoirs by either replacing them or covering them, which has done an awful lot of good.

DR. MARKS: Thank you. Our next speaker is Paul Arbesman from the state of New Jersey.

Biography

PAUL H. ARBESMAN

PAUL H. ARBESMAN is deputy commissioner of the New Jersey Department of Environmental Protection in Trenton, whose operations include all phases of air, water, and hazardous waste pollution control and management of parks, wildlife, and coastal zones. In February 1981, he was appointed drought coordinator to manage all aspects of New Jersey's severe water shortage. He has also served with EPA, managing air quality and environmental impact programs for the New York and Caribbean Region. He holds an M.S. in chemical engineering from the University of Maryland.

STATE PERSPECTIVE ON URBAN WATER MANAGEMENT AND INFRASTRUCTURE REHABILITATION

Paul Arbesman
Department of Environmental
  Protection
State of New Jersey
Trenton, New Jersey

I am awed by the caliber of the speakers here today, and the people who are attending this conference. In dealing with our state problems, I do not often get a chance to talk with such a fine array of experts in the various fields. It has been very interesting for me just to listen to the discussions, and I think the same is probably true for you. I have jotted down probably half a dozen creative ideas that I am going to take back to my state and see what I can do with them.

It is really interesting that at this conference on water, we are really talking about the politics of decision making. Do you notice that? I do not care whether it is water, resource, recovery, or transportation, it is all focused on politics. I guess the long-term politics of decision making was set forth back in the 1800s, because our predecessors left us with all these systems that we are so grateful for, and it seems that as the years went by, it became more short-term in its orientation, and now it is almost a year-by-year approach.

In fact, in New Jersey, we are in a deficit situation, just like California. I also find that over these great regional differences in our country the problems are the same. I could take New Jersey, which is tiny, but I could turn it over, and it would look like the Bay Area, and I could describe the same lack of interconnections, archaic structures, and divisiveness between the political entities. They are all barriers to bringing about the solutions that we want.

I also want you to know that I do not have a great deal of sympathy for the water supply industry. When I got appointed drought coordinator in New Jersey in 1980, 1981, when a drought hit, I read the record of the 1960s drought, and I noted that when the 1960s drought began, I was in high school, and when it ended I was in college. Then all of a sudden the drought of the 1980s became my problem, and I had to go out and explain to people why we had all of these problems. I find, in general, that people in the industry are somewhat laid back, no risk takers, but they are great hindsighters, especially for the other guy, and if the other guy had done this, we wouldn't have this problem now, and that gives me great problems, because these people are running businesses, the way I see it. They are getting paid salaries. They have an investment out there that they are supposed to protect, and it was not done because of lack of political will. In New Jersey, we have 630 water systems in 567 municipalities, about half public, half private. We tend to discuss problems, not solve them. I think that is also characteristic of what we have heard about today.

When the drought became so bad that we started to run out of supply in the northeastern part of the state, which is our heaviest concentration of industry and people, the water industry came to the governor and asked for help. Now, we really have no role in the water business in terms of running companies, but with three million people and 66 percent of the jobs at stake in the state, we had little alternative but to get into the business. We got into the business by invoking the governor's war powers. Imagine that. War powers for a water crisis. We imposed rationing requirements. We went into people's homes, put them on 50 gallons per person per day and cut industry back by 25 percent of its normal usage. We then had water company representatives out there taking records door by door, filling out postcards, to find out what our data base was. The first thing you find out in this business is that you have no data base. You have no bill collection system that is in any way sensible for a drought management program. We were fining people, and we could not get the bills out until six months later. It is the old story about striking while the iron is hot. People forgot about it.

It is a very, very tough problem. On my first day on the job after I was appointed, they sent me to the legislature. I was there from 9:00 in the morning until 6:00 in the afternoon, and I walked out with $20 million in projects. We built more projects in six months than we probably have in the past 16 years, for example, pipelines. In fact, we used the Bay Area example of the pipeline over the bridge. We built one over the George Washington Bridge, and that one is still there, but we are also taking it out, not because they would not agree but because we built it to take it out because it is on the sidewalk. We are going to store it and then we can reassemble it, if needed, so it is a good piece of equipment.

We also had some great experiences. I think the best quote of the drought that we had was provided by our state police superintendent when we had a meeting in February of 1981. It was really the low point. We had 20 days of supply left in our major systems. There was no end in sight, no rain. Everything had gone downhill. We had pumped out recreational lakes and transferred water wherever we could get it, from interstate to over the bridge. We were about ready to bottom out, and this reporter walks up to the state police superintendent, and says, "What are you going to do when the water runs out and the buildings are on fire?" He said, "Let the suckers burn." Well, the next day's headline was, "state police says, 'Let the suckers burn.'" He put out a press statement the next day that said, "I really said, 'Let the structures burn.'" The effect was there. We talked about motivating and really getting people excited. Well, that got them excited.

Thank goodness the people in the industry heard the message, because they saved water as we had never seen it saved before, and 90 percent of the people saved too. We only fined about 10 percent of the people on the water systems, and we saved about 20 billion gallons of water, which in our area is about a third of the total storage capacity of the whole water system in the northeastern part of the state, about a 25 to 30 percent cutback, which is very significant and really stretched out our reserves. In February, when we were in this peak period, we went to a briefing in the White House to try to get emergency federal assistance. On that day it started to rain, and it rained for four days thereafter. The governor later said that it was the quickest response he had ever got to a request for federal assistance. We did not know it then, but that was the turning point of the drought.

One of the first things I did in this business, since I was not a weather engineer, was to meet with a meteorologist. I asked the same things you did. I was told that there is no period for droughts, that their occurrence cannot be predicted. I asked, "When are you going to tell me it is going to end?" He said, "Six months after it is over, you will know it." Right? And that is exactly what it was. We did not know that the February period of rain had started the recovery. One of our credibility problems was that, every time we would meet on the drought, it would rain, and then it would stop, and so we kept on meeting. Anyway, we used the drought as an opportunity. We decided to see if we could solve some problems rather than just a short-term problem of a drought. We got four major pieces of legislation through the legislature, including a new state water authority, a $350 million bond issue for water supply system development, and a brand-new statutory base for water management in the state of New Jersey. We threw out the old base, which had been adopted in 1903.

I do not know if you have got it in your state. In our state we give away whole rivers. They call them "grandfather rights." We had companies set up that distributed the water. The state did not control the water. In one case it gave away the whole river. Because of that opportunity, we got the grandfather rights issue settled. We set up a permitting system that had the capability to look at it on a system by system basis, and I think this decade for New Jersey is going to be the telling point whether we repeat the same mistakes that we made in the 1960s. That is, forget about it or take all those opportunities now and really make something out of them.

That is what I was talking to Bob about--risk assessment. We are into yield studies now in the northeastern part of the state. We are going to come up with a number that is a deficit, and we either have to decide to meet it or find some way or reason to say that we are not going to meet it and we are going to accept the risks. I need that study, and I hope some of your intelligence, too, to help us make those decisions. We also adopted the state water supply master plan, and that puts into blueprint form for the whole state the types of actions that we intend to take over the period of the next 10 to 20 years, reaching into about the same time period you have, some time between the years 2020 and 2030. We are doing this to try to see that we have safe supplies. Whether we accept some risk on a drought is an open question. We have not decided that yet.

What is really interesting to me now, besides all of the other issues of quality and quantity and everything else, is the question of how we are going to finance all this. I can put $350 million into one urban system, just for repairing the lines, and if I give it out in grants, it is gone, and I have got to go back for more. I do not know if you know how many states have triple A bond rating. It is about six or nine. New Jersey happens to be one, and we are very protective of it. If we keep going back to Government bonds as a way of financing these types of systems, we deteriorate our bond rating capability. It costs more to do it, and we are very concerned about that.

So, as the governor announced a couple of weeks ago, we have come up with an idea for an infrastructure bank. This infrastructure bank concept would work somewhat as follows. We patterned it on the sewer problem initially, but applied it to resource recovery, water supply, highways, and other forms of infrastructure needs at the same time. Essentially, it takes advantage of tax laws. Anything we can take advantage of--federal grants, state bond issues--would capitalize the bank. Federal appropriations and state bond issues that are outstanding would go into the bank as a deposit. We would establish a reserve account in the bank, and from the overall reserve account we would give out loans, whether they be for water, sewage, resource recovery, etc. Probably those three areas would be eligible for loans. User charges would pay back the loans into the bank. A revolving fund is created.

The advantage is that we are offering no-interest loans. On the payback period we worked with two Wall Street banking houses, which I think is important, and also the two rating agencies on Wall Street that looked at our ratings to make sure that this was all appropriate from their standpoint, and it is. We set the term in sewers to a 15-year payback period on a no-interest loan. It pretty much comes close to equaling a federal grant program at the finally authorized level currently established under the Clean Water Act. That is a pretty good solution. Under the existing grant program that runs out in 1984 for sewers, we would be able to reach only 11 projects out of 230 in New Jersey on the sewer list, and a lot of those sewers dump into our water supply systems.

In the peak of the drought, one of our main water supply systems was the Passaic River, which was taking in 90-100 percent poorly treated sewage. You have heard about break point chlorination in sewage plants. We were doing breakpoint chlorination in water treatment plants. It was a terrible problem, and the sewer problem is intertwined in our overall water management strategy. We cannot solve one without the other. We currently have $300 million in federal funds for projects. If we get $300 million more, and another state bond issue, we can complete the sewer list, all 230 projects using the infrastructure bank concept. We would not need any other federal appropriations. If we got more federal appropriations, it would be gravy, but all of the money would be revolving back into the bank. Then, at the end of the period according to the computer models, we would have close to $2 billion of projects constructed, and we would have a bank with approximately $1 billion to $2 billion in it as a bankroll for new projects. So, on paper it looks as if it would work. We cannot do it without changing the federal law and some changes in our own state bond covenants. We have got to go back to the voters for the bond covenants, and we have already met with Congressmen Howard and Roe on changes of the Public Works Committee in relation to these changes.

I think all these things are positive. I think the financing issue in our state is of paramount importance. It is the thing that really greases the wheels to make people say yes or no. I have found more often than not that when you get down to the nitty gritty issue, if you cannot find the dollars to do it, it just sits on the shelf someplace. I assume that you have probably had the same experience.

The other element of the funding program that is part of the computer modeling is the use of the new tax laws. The concept is an engineering firm, for instance, that comes in, buys a public system, a sewer, or water, or constructs a resource recovery plant. We found, so far, that the definitions in the tax laws are not great for collection systems or interconnections. They are great for heavy capital equipment, treatment plants, pumps, secondary treatment works, or head structures. What we are looking at is a potential marriage between the privatization concept using the tax laws and the bank concept using public money, where the bank might build the collection or the distribution systems or rehabilitate the distribution systems of the water supply and the private money might be used for the heavy capital investment, essentially buying the tax credits under the tax code.

Now, this all means potentially that those tax credits have to continue, which is an open question now in Congress, as we heard with regard to Nassau County. The whole basis for the sewer program was grants. They gave grants, and the federal government is essentially cutting out the grants for everyone, so all the sewer authorities are out there scrambling for vehicles to substitute for the federal grant program.

I have likened it to a heroin addiction. Once you get on a federal grant program, you cannot get off. Now, these people are into methadone treatment. We have county authorities in New Jersey, and one in particular has invested $60 million in planning for a sewage treatment plant. It has no service connections, no service fees yet, and now it is told that it cannot get high enough on the priority list to get the grant to build the system. What is the alternative? Default.

Incidentally, for your states, the Wall Street houses tell us that once the sewer authorities start to go, it is going to send a ripple effect through the whole marketplace if they go, in terms of public financing for all types of infrastructure. So I would be concerned about that. We are trying to fill that gap through this bank concept.

GENERAL DISCUSSION

QUESTION: Concerning this infrastructure bank, you say the money is going to come in by user charges. Are they going to deal with individuals, or are these user charges to communities?

MR. ARBESMAN: These are communities, or charges for water systems, or sewer charges. They collect the money and pay back the debt to the state. In other words, the state puts up the loan. They pay back the principal, and if there is any interest, they pay on a yearly basis over a period of time. On sewers, we worked it out to be a 15-year time period but no interest.

QUESTION: But do the users in the community pay it to the community, and the community pays it to the bank?

MR. ARBESMAN: Yes, it is a wholesale loan. That is the way it is structured. The bank could also wholesale bonds for the communities. The community might have a B rating. The bank could take six communities that are in that situation, put together a bond sale package, maybe get a double A rating because of its stature, and give that extra advantage to the communities as well, plus save them the up front financing cost, which is another advantage, all trying to work toward incentives to financing these systems.

QUESTION: To follow up that question, if there is a default, who cures it?

MR. ARBESMAN: That will be dealt with in the contract. If it is a default in the loan, we have in the state budget a so-called state aid, and we are talking about commandeering the state aid if there is a default on the payments as a condition on the contract. So essentially, if the community did not pay back the loan this way, it would not get its state aid.

QUESTION: Is it like the tobacco tax where the state pays it back?

MR. ARBESMAN: Well, state tax or income tax. Income tax in New Jersey is all dedicated to schools.

QUESTION: So you feel that you have the structure but the credit of the state is not going to be adversely affected?

MR. ARBESMAN: That's right. That's why we went to the two ratings houses, Moody's and Standard and Poor's, to ask that very question, because we didn't want to set up something that was going to be worse. It takes the pressure off state general obligation bonding over the long term, because you set up this revolving fund account that continues to fuel itself, so the more you build, the more you are getting back in.

QUESTION: Two questions. First, what changes do you think you need in federal legislation? Second, at the time of the bond issue, there was a lot of talk about using the state authority to force local water suppliers to go to a more rational pricing system and change the pricing structure. Is that a true perception? Is that coming out, and if so, when?

MR. ARBESMAN: Regarding the first question, for the first program on sewage, we only need a change to allow us to use the federal appropriation money for the states as loans, rather than grant money, and allow us to continue to roll it over in the bank year after year. There is no water supply money that we get in New Jersey, and there is no resource recovery money. Those would come from state sources or private investment.

Regarding the second question, we have not even gotten to the pricing issue. We are going through some technical work right now in terms of the permitting function, and we are working now on an emergency rate structure that would be imposed during the next drought, which I think would be our first attempt at conservation pricing, but we are going to need a lot of help. We are not as smart as a lot of folks in this room, I will tell you that right now. It seems that a lot of pioneering work will have to be done, and I am really glad, because I have got some ideas here today.

QUESTION: On the infrastructure bank, future state funds are secured only by the contract with the local unit. Is that correct? The taxing power of the state is not pledged?

MR. ARBESMAN: For the general obligation bonds that are currently approved by the voter, the state is pledged behind those.

QUESTION: But they don't go into the infrastructure bank?

MR. ARBESMAN: They do go into the infrastructure bank. In other words, you've got laws that are limited to three years of investment and interest-earned income on those kinds of bonds. We can appropriate what we expect to use over a three-year period. The bank can earn money on it, to generate that from infrastructure reinvestment and keep on pooling the money that way, but once the money is repaid, it is not bound by the same bond covenants that the original bond dollars were intended for. So you have more flexibility for the bank.

QUESTION: One of the things we did in looking at financing ourselves, at the Washington Suburban Sanitary Commission, was that we proposed a hookup charge, a system expansion offset charge. It is a cost per building unit to pay for future plants. Did you consider, since you are going to be financing a lot of water, any charge like that? If you haven't, I would suggest it is worthwhile. A new house is going to put a burden on that infrastructure. Our total charge is $1,700, of which about $800 is for future water supply.

MR. ARBESMAN: Our individual systems have system hookup charges now, but they are not sufficiently established to do what you have indicated yours can do, and I think we also considered the possibility of a statewide user charge to fuel the bank, where people would pay an excess amount on their bill that would go to the bank to finance rehabilitation of the systems. But it worked out that with the money available on the bond issue and the other accounts we can roll over that and, in effect, have the user charges on individual system repairs pay back the bank sufficiently to make it work.

QUESTION: New Jersey is a signatory to the Delaware River Basin Compact. Would you make any comment about the usefulness of that to New Jersey? That is supposed to be, in the east at least, one of the more comprehensive interstate arrangements. I would like to have your comments.

MR. ARBESMAN: That is very important. It is not only a federally approved compact. It also has a Supreme Court decision that has allocated the water in the basin, which is very important to us. It was the mechanism during the drought that divided up the water between four states, and the city of New York effectively held conservation releases in the river and had individual rollbacks in all of the states that we could live with. It was a sensible decision-making approach. The four governors and the mayor met in January of 1981 and adopted those rollback requirements that were equitable to all parties. I don't know what we would have done if it weren't for the Delaware River Basin Compact.

QUESTION: If you are going to loan that money back at no interest, loan that money out, and you are paying interest on at least a portion of that money coming in, aren't you in fact going to be continually depleting the reserves or what is available in that bank by doing that?

MR. ARBESMAN: Let me explain that. The no interest part would be for the sewer program. The interest is essentially subsidized by the federal appropriation that comes into the bank, and in water supply there will be an interest charge on the money, although it will be much reduced and with more liberal payback terms. We can front end the cost with a period of, say, two to three years with no payback while they get the construction done, in order to generate the revenues to pay it back. There are flexibilities that you can use in the system when you have got enough resources. But you must approach it on a case-by-case basis. If a facility has the ability to pay back initially and wants to take advantage of the financing of the bank, that is the way the contract would be structured.

QUESTION: Paul, as I understand it, you are almost dictating rates for every system in the state, or only those that are going to participate?

MR. ARBESMAN: Only those that are going to participate. It is voluntary. Now, during the drought, we also got one of the largest water projects started. It was another opportunity we took advantage of. In the northeastern part of the state, it was a $90 million project to recharge two different reservoirs and two basins that had been on the books for 15 years. We got a rate increase through the Board of Public Utilities for the one system that more than doubled the rate in one year. I almost fell over backwards in New Jersey when I heard that, but it was the fair cost of paying for the water and being taken care of.

QUESTION: So a system that is properly run is not penalized?

MR. ARBESMAN: If they wanted to take advantage of it, they could. Now, we are talking about public systems now, but private systems essentially have their own market and the tax laws to work through as well, plus we have a State Economic Development Authority that floats taxes into bonds to help in financing.

QUESTION: Do I understand that these loans are not available for privately owned facilities but only for publicly owned ones?

MR. ARBESMAN: That's right.

DR. MARKS: But they would probably pick up the distribution part so that the private companies could come in and do the treatment and get a big tax write-off.

QUESTION: There is a tax write-off. I am only an engineer, but it seems to me that ultimately you get back to the federal taxpayer, who is putting money into a system for tax breaks, and in a sense you might unkindly call it a raid on the Treasury, and everybody might do it until they get ahead of it.

MR. ARBESMAN: Look, I think you can make as good an argument for subsidizing the system through the tax laws as you can for subsidizing the tobacco industry or anybody on the books. Now, if you say it is not good for the water industry, then it is not good for the other industry.

QUESTION: Well, there was a period when water supply was in the private sector, and gradually public agencies bought them out. Now, this trend is going to move them back into the private sector. Will the public agencies be in a position to buy them out at a future time?

MR. ARBESMAN: Well, just from my limited experience, I found the private systems much more capably managed in our state, and I wouldn't be adverse at all, because the private systems have stockholders, equity investment, and reserves. I am not saying this is all the way down the line, because you are going to find lousy systems in the private sector, too. The public systems wind up with too much of that stuff that was discussed here, bleeding off the revenues into the general operations. So unless you can get some control in the financial side of that in the public sector, I don't know where you are going.

QUESTION: This is very innovative financing, but how about the states that cannot issue bonds?

MR. ARBESMAN: Then you would have to go to a user tax as a way of fueling the bank over a period of time. You are really talking about redistributing the assets of the state.

QUESTION: There are several states that can't issue bonds.

MR. ARBESMAN: We can only issue bonds by going to the voters. We cannot issue bonds. In fact, that is one of the reasons the State Water Authority was created. Only a state authority has the authority to issue revenue bonds. General obligation bonds or revenue bonds cannot be issued by the state of New Jersey unless we go to the voters. You could go for a general obligation bond, couldn't you? You couldn't have a general obligation bond authorized by the voters.

QUESTION: Have you ever heard of a cash basis loan?

MR. ARBESMAN: Our budget is balanced constitutionally also. Every year we have a balanced budget, and if we have a general obligation bond, the debt service of that has to be factored into the budget that year. We did research the field. We looked at Ohio's laws and at New York's laws and what both cities have done in the past. I guess the difference here is that we are in a position of having three quarters of a billion dollars of voter authorized bond issues that we can capitalize the bank with. If we use them in the old way, we just give the money out and it is gone. If we use them in this way and have people pay more of a reasonable charge for what they have to build, we refuel it and keep it a dedicated account to drive infrastructure repair. I think that is the difference. Plus we take in the federal money and use it creatively so that it doesn't disappear, because you can't depend on these federal appropriations any more.

QUESTION: I want to clarify the creative use of federal money. I take it that when the construction grant funds would come in, they would be focused on a particular community. You are proposing that they would be given to the bank as a funding mechanism, with the idea that goods and services will be produced in the same general area, but that no allocation is made to community A or B. Is that correct?

MR. ARBESMAN: We just need to be able to use the federal money as a loan pot. We would follow all existing priorities, all existing federal regulations, and all the projects that got the money would be on a state of federally approved priority list.

DR. MARKS: Thank you Paul. I'd like to introduce Jim Crews from the Corp of Engineers, who is our next speaker.

Biography

JAMES E. CREWS

JAMES E. CREWS coordinates the Corps of Engineers program for water supply and water conservation research and planning activities at the Institute for Water Resources. In his career with the Corps of Engineers, he has been primarily involved in water supply planning activities and has authored numerous papers on this subject. In 1978 he was awarded the Baltimore District and the North Atlantic Division Engineer of the Year awards for his work on the Metropolitan Washington Area Water Supply Study. He is a vice-president of the National Capitol Section, American Water Resources Association, and past president of the Baltimore Post of the Society of American Military Engineers, and is a member of the Society of Civil Engineers, International Water Resources Association, and the American Geophysical Union. He holds an M.A. in civil engineering from Catholic University.

COOPERATION IN URBAN WATER MANAGEMENT

James E. Crews
Institute for Water Resources
Corps of Engineers
Ft. Belvoir, Virginia

It is difficult for a federal employee to talk to state and local officials about state programs and local agency responsibilities, but that is what I have been asked to do.

If you review my written remarks, you will see that my emphasis is on shared responsibility and information transfer. That is what I want to address. I also want to talk about these areas with regard to water conservation, with emphasis on efficiency of conservation.

I am going to use one of John Boland's earlier remarks, namely, that one of the barriers to urban areas is conservation. I am not talking about conservation from the viewpoint of motherhood, apple pie, and the national ethic. I am talking about beneficial conservation, when the total benefits outweigh the total costs. The Corps is in a period of transition, as are all federal agencies. The emphasis is now being placed on state responsibilities. You can all see the change, especially concerning future federal projects.

Mr. McGarry's comments about taking 20 years to implement a federal project is very true. We are going through a period now of no new reservoir projects, and it appears that it will be quite some time before any new ones are constructed. Because of this and other changes, the Corps has initiated a new research program in water supply and water conservation planning. The Corps research program is oriented toward mission-related problems; therefore, we are looking at our own projects from a more efficient viewpoint, or are using and managing what we have better.

In the past when states or local utilities came to the Corps and requested to buy storage in an existing reservoir that had excess capacity, we said, Sure, no problem. Now we are examining the demand side of the utility's water use to see if their water use can be managed more efficiently.

So, through the Corps reseach program on water supply and water conservation, we are looking at all aspects of water use, with heavy emphasis on water conservation. The Corps has developed procedures through consultants like Dr. Boland and others on how to effectively evaluate water conservation measures, especially from a benefit-cost standpoint. When we first started this research program, we had some interesting discussions with the state of California, and as most of you know, California has a very active water conservation program. In the state of California they essentially started their program from the viewpoint that water conservation was a good idea and the ethical thing to do.

Well, they have changed their emphasis. I am not saying that they changed it because of us, but I think they have changed because of what they saw happening. Water conservation came to the forefront because of droughts and emergency situations, but now emphasis must be placed on the more long-term implications of conservation. We have heard remarks addressed today here by Jerry Gilbert and others about tightening systems and what happens when you have a tight system and then experience a drought. Questions like this cannot be answered just yet, because we do not know all the consequences. Obviously, that is one of the things we are concerned about: the long-term impacts of conservation; how systems are going to react to long-term conservation implications.

I do think, though, that there is resiliency in systems, and it has allowed us to get where we are today. But I also think that there is room for improving water management in utilities. From the studies that we have done and others, improvements can be made through, for example, leak detection programs that can extend the life of a system for a short period of time.

I gave a paper on Tuesday in California at the American Water Resources Association on "A National Perspective on Water Conservation," and at that conference there were three different surveys: one by the Corps' Engineer Institute for Water Resources on state water conservation programs, one by Tom Debo of Georgia Tech through an OWRT grant, and one by Brent Blackwelder of the Environmental Policy Institute. One thing that I found very interesting was that all our findings were different. Generally, we all agreed that there are about 20 states that have full-time conservation programs, but we cannot all agree on the specific states. This points out a real need for information exchange and technology transfer. The institute is very much interested in this area and is making available a lot of the information that we have developed on more efficient management of systems to the people who need it.

Recently, we held a meeting with state representatives who have active water conservation programs. One of the recommendations of that group was for the Corps to set up a national clearinghouse on water conservation information. However, that is a task we do not know we can actually do, but we are looking at that possibility. We also are developing for our own use, as well as for others, a good demand forecasting model that will help utilities make better water demand forecasts so that they can understand the impacts of conservation. It is impossible to do water conservation studies or understand water conservation impacts if you do not have good demand forecasts. I think demand conservation forecasting and conservation will take on the same impact that the energy crisis did in the early 1970s.

We have developed a lot of information. If you are interested in any copy of the Corps publications, call and I will be glad to help you in any area that I can regarding more efficient management of water systems.

GENERAL DISCUSSION

QUESTION: On page 2 of your written comments, tell us what you mean by devoting new research and intelligence efforts to produce new techniques that will undoubtedly yield unlikely results.

MR. CREWS: What I meant by that was I don't think that the federal level, as, for example, the Corps and maybe some others, should put a lot of money into new technology, research and supply management, that type of thing. I think our resources can now be spent better in the demand side of the equation.

I truly don't think, if you go back to the experience I've had in the Washington area, that we could spend a lot of money to come up with a technique to solve Washington's water problem on an engineering solution to the problem. Everything was done. It took management's side, it took institutional assistance, if you will, to help solve the problem. It's not a technical solution; it's a management solution.

QUESTION: My question is that I don't know what I could turn to the Corps for in help on water conservation. And if I wanted some information about water conservation, you specifically said to get in touch. What kind of information would you be able to relay back that would be helpful in looking at an individual system?

MR. CREWS: Some of the things that we have developed are manuals, procedures, and actual bibliographies of procedures manuals for evaluating water conservation, for doing demand forecasting. We've got about eight publications that are directly oriented to water conservation, demand forecasting, and water supply analysis. The procedures manual that I use in that term is a very exact procedure for evaluating the effectiveness of a water conservation measure, plus combining measures into plans to determine if it would be cost effective for a utility to implement conservation.

The problem we have in the Corps is that all these numbers that are floating around in the literature from studies that are done to show the effectiveness of conservation in many cases are very greatly distorted because either the study wasn't done right or they didn't take extraneous factors such as weather or price changes or something like that into account.

And we're trying to point out how a local utility or others might evaluate conservation before they go about saying, "It's a good idea," and "Let's do it."

QUESTION: Some of the use of rates to encourage conservation, higher rates per unit--if you start with the assumption that the rate existing before that time was "fair," equitable, whatever it was, then the result of imposing that not only includes conservation and lower consumption but also includes a redistribution of income. Have you, John, anybody else doing that, do you consider that in deciding on conservation? That is, given the same-size plant, all that you're doing at that particular time is you're redistributing income, if the first system was fair.

MR. McGARRY: I'd like to try to answer that. and I hope there are friends in the room and I don't read this in the paper. We are the only ones in the country who have an increasing rate structure where the more you use the more you pay per thousand. In addition to causing conservation, it has caused very low bills for most of the people, and the people with the big lawns in Potomac are getting bigger bills.

But to them, even the bigger bill is so much smaller than their monthly American Express charges that it goes unnoticed. However, those people who can afford an American Express card are also the people who call their council person and vote, thus their bills are really low; so they think we're doing great. Therefore, it is redistributed. Cost conservation has redistributed, but his bill is the political base that we didn't think we were going to get. It's a very unusual phenomenon. Think about it. If you have a large house in Potomac with a big lawn and your water bill is $500 a year, that, compared to your other expenses, is probably trivial. But these people who are living in single-family homes, say, a retired couple--and we have lots of them--with bills of $25 a year, they think we're doing great.

QUESTION: I think what you're really talking about is efficient water management. And you said the Californians have this as an ethic. It's crazy but it seems that they saw through it. I think conservation as an objective is not helpful. It's good for the soul.

MR. CREWS: Yes, as you say, it's good for the soul when you speak about it from a really good viewpoint. But yes, we tend to say that if it's not beneficial, don't do it.

QUESTION: What Bob McGarry is talking about may be a good social policy, but it goes beyond that. Because some studies done years ago indicated that a guy with a big lawn who did use high rates of water did, in fact, cause high expenditures of capital to build the system. So it's only fair.

MR. McGARRY: It's conserved, it's made those users pay, but it has also had the subtle effect of building us a constituency at both ends who think we're doing great.

DR. MARKS: Thank you Jim. I'd now like to introduce Truman Goins from HUD, our next speaker.

Biography

TRUMAN GOINS

TRUMAN GOINS is water resources coordinator at the Department of Housing and Urban Development. He provides support to the assistant secretary and representation for the secretary as a member of the Water Resources Council and represents the department on interagency committees and task forces charged with policy on water and related resources. Over the years he has provided technical expertise to HUD on activities that include water resources planning and development, floodplain mapping, flood insurance regulations, and flood hazard mitigation. Before joining the staff at HUD, he worked with the Department of Agriculture's research programs on soil and water management of farmlands in Virginia. He is a retired Coast Guard Commander and holds an M.S. degree in engineering from Ohio State.

URBAN WATER MANAGEMENT

Truman Goins
Water Resources Coordination
Department of Housing and Urban
  Development
Washington, D.C.

Dr. Abel Wolman, in a recent guest editorial, termed the current constraints on the federal budget as a "fiscal drought." He stated that "the New Federalism should mean a return in the water field to time honored and successful practices over more than a century, under the responsibility and autonomy of local political subdivisions," and "changes in attitudes, in policy in ratio are undoubtedly essential, but let us move into the job and stop trying to resurrect the good old past (which it never was)." This conference is a part of that effort.

He also spoke again on the same subject and expanded on it at a workshop held by the U.S. Geological Survey concerning the Potomac River estuary, in which he expressed the idea; we have begun to do that, to face the economic realities, to gather our energies and resources and proceed to do what has to be done. I think there is plenty of evidence as the discussion here today has indicated, that this is being done or will be done.

I took the opportunity to attach to my paper a summary of the recent urban policy report, which also reflects the same sense of resolve that we have to take in terms of the fiscal constraints that we are under today. This report, which is prepared every two years by HUD and sent to the President for submission to the Congress, in essence states that the national urban policy is an evolving policy and that it seeks a better balance of revenue resources and responsibilities among federal, state, and local governments. I think, as we go along, you will see these policies enunciated from time to time and changed as we move from program to program.

There are a few basic premises that are expressed, and I would like to just cite a few of them that give a preface for our programs in HUD as we are currently operating them. One of the premises expressed that the states and cities, properly unfettered, can manage themselves more wisely than the federal government can; that certain problems in cities such as crimes and infrastructure needs require special attention; that the private sector, both corporate and voluntary, contains important sources of strength and creativity that must be tapped for the nation to progress; that ultimately, the key to healthy cities is a healthy economy.

HUD has a large stake in the urban water systems through the use of its block grant funds. In fact, one of the programs that was mentioned in New Hampshire was cited as a HUD grant for water and sewer, which I believe was a categorical grant from back in the early 1970s. All of the categorical grants that we had at that time were folded into the community development block grant program in 1975. The activities that are eligible under the block grants were taken from the categorical grants and other activities that Congress wrote into the legislation and are now funded under the community development block grant program. These are principally funded through three separate programs.

One is the entitlement program that funds metropolitan areas and metro counties under an entitlement formula grant. Small cities with a population of 55,000 and below are supported through competitive grants. Another portion of the program is designated as discretionary funds for special purpose activities, particularly in support of technical assistance, Indian programs, and special categories that HUD has an obligation to support.

The other major HUD grant program that includes urban water system activities is the Urban Development Action Grant Program, which is primarily directed at the inner-city distressed areas, to rebuild inner cities and to address special problems. It is funded, I believe, this year at around the $400 million level.

The block grants have been funded of the order of $3.8 billion a year, and the recent budget changes, as indicated, probably had a 5 or 10 percent decrease over the past two years. So these programs have survived fairly well in terms of the present budget situation.

One of the innovative approaches that we are taking under the new policy for the grant programs is to encourage the states to manage the small-city grant program. It was recently indicated that some 36 states had accepted this offer to manage the allocation and the expenditure of the small-city grant funds. So this will be an effort of the local communities working with the states in terms of their priorities to get funding for the highest priorities and those activities that are urgently needed.

These monies, in terms of the total program that has been talked about today for water supply systems, certainly will not meet all the demands, and the federal funding that was indicated in New Jersey was primarily funding through the Environmental Protection Agency which funds more directly the waste treatment systems. HUD money is for all infrastructure support in terms of community development, and the various activities have to compete with each other in terms of the most urgent needs, and that decision rests with the community.

How best can these funds be leveraged by local government or by the states where they assist in the design of programs and allocation of funds? What local arrangements, institutional types, partnerships, corporations, or associations can best serve to consolidate maximum resources and serve best the infrastructure system to insure adequate water supply of suitable quality in particular jurisdictions, small cities, large metropolitan areas, major cities, and regional or areawide systems? Just as important are the financing and institutional arrangements for support of infrastructure systems of particular jurisdictions, irrespective of the size or location or the region and hydrologic parameters within which the planning and development must take place.

This regional planning has been funded in the past in part through a HUD 701 comprehensive planning grant program. This program is no longer funded; it is being phased out even though there are some funds still to be closed out.

The comprehensive planning--river basin planning that was done through the Title II river basin commissions--has essentially been phased out. The Title II river basin commissions have been abolished. They have largely been replaced by some interstate association that will carry on some planning effort, but at the moment I am not sure how it will be funded or to what extent that program will be affected. I looked at this as being a void that would need to be picked up through some new institutional arrangement, either by state or local governments or by subbasin authorities, to carry out either areawide or basin planning and to merge that planning with the water supply planning that is done for a particular facility.

In the regional water resources planning context, there are two river basin compacts and some interagency committees that are still active. There was a report by the American Water Resources Association study group that assessed the need for river basin commissions or subbasin planning entities to address and resolve issues of conflicting demands on available water resources. Whether this study will generate any interest in small-basin authorities or whether it can be picked up in the regional type of planning and development concept that has been discussed here is a matter yet to be determined. I am very much encouraged by this meeting. On the basis of the discussion here today, I think that the regional development and planning is going forward very effectively.

GENERAL DISCUSSION

QUESTION: Do I understand you correctly, does HUD still give out grants for small regionalized systems?

MR. GOINS: We try not to compete with EPA. That's one thing I wanted to make clear earlier; the water and sewer grant program now is primarily funded through EPA. Our funds are community development block grant funds. It is to develop infrastructure support for community development in support of housing. But, if a water supply system is essential to that development and it can be done depends on whether that is part of your development plan and whether it is essential and whether there are no funds available from EPA to start with, and a lot of other things. But we do not have a categorical grant for water supply systems.

QUESTION: What does EPA do about insuring that these systems are properly operated? Follow-up activity to be sure that they are being operated and maintained properly as, let's say, an enterprise system or whatever?

MR. GOINS: I think EPA can answer that better than I can. We do not oversee operations in terms of systems. Our grants are support grants to community activities, and they have a full responsibility for the program operation. I don't know what kind of constraints EPA might put on its funds.

MR. CLARK: We don't have any water supply grants.

MR. GOINS: You don't fund water-sewer systems at all?

MR. CLARK: Just the sewer systems.

MR. GOINS: Farmers Home can fund them, and I know we do under certain circumstances, but as I said, it's not a water system grant. It is a community development grant.

QUESTION: Can we get an idea of how much you put into new water systems last year?

MR. GOINS: I can get it for you. I do not have it now. So, say, for about three years ago I can give you some figures as to how much was spent for water and sewer. It was very small. All but about 15 percent is for block grants, and most of that is streets and bridges.

QUESTION: If you were the public official making the decision and the water rates were maintained by a separate agency or others, and you could affect the tax rate by applying for community development fund through other projects, it's obvious where you're going to apply. We have not seen a dime from the city of Manchester on the community development monies. I haven't really asked for it because I'm afraid of what might go along with it.

MR. GOINS: In past years, the activity that is identified as water-sewer support (which is primarily distribution lines to subdivisions, really), which would be the major expenditure, has been running 2, 3, 5, or 6 percent of the grant. There are other things that you might want to put into there, for example, water-based recreation and fire systems, and that sort of thing, which would bring it up some, but I think it wouldn't run over 6 or 8 or 10 percent. That would be a high year.

QUESTION: I am very intrigued with the statement that you made with regard to abolishing the six river basin commissions, that this is probably a void which needs to be picked up in some way and needs to go forth. Is that what I understood you're saying? I guess the real thrust of what I'm asking is, Does this represent within HUD some recognition of the value of this type of regional basis?

MR. GOINS: No, I would not want to tie that to HUD because this administration abolished the river basin commission.

QUESTION: That's why I questioned your statement.

MR. GOINS: They did not fund the river basin planning. In addition to that, HUD has eliminated the funding for the 701 planning, which is essentially areawide planning. I believe it just indicates another step, as far as HUD is concerned, in terms of the road that we have gone down in terms of block grants. We folded all of our categorical grants into block grants. You can do planning under community development block grants if you'd like, but you would have to decide if it needs to be done.

The only thing I'm saying is that there is not a federal fund now for regional planning or areawide planning, separately at least in HUD or through the river basin commissions. If you feel it needs to be done, then the state and the local governments are going to have to figure out some way to do it.

QUESTION: Of course, I feel it always needed to be done and they shouldn't have been abolished. I think that was a very unwise move on the part of the administration. I think they should have looked at their mission at that time and should have determined what would be more effective.

We're having a meeting now here, discussing regional entities and looking at regional bodies. And here we had something, and the previous speaker just said, "Thank God we had the Delaware River." If we hadn't had that commission, I don't know how we could have worked, and yet we've an administration that came in and threw this all out. Yet we've had this whole discussion today, and I just find it very ironic that the last speaker of the day would go into that.

MR. GOINS: Well, I personally think it is very important to interface regional planning and resource planning with economic and social development planning, and I think you can't separate them. But who has the major responsibility for doing that? What the federal and national interest is I am not prepared to say, but I think this body should address that.

MORNING SESSION
October 15, 1982

DR. MARKS: Ladies and gentlemen, I would like to welcome you to the continuing saga of "Cooperation in Urban Water Management." We have gone through a first day of generic concerns, a look at specific problems at different levels and then at the state regulatory overview level. This morning's speakers will attempt to give some impressions from people who are looking at a larger public purview to understand where water fits in, in terms of priorities with other public concerns--school, education, highways, other types of infrastructure.

When we originally put this conference together, we thought that one of the main purposes of this meeting might be how we convince water utility managers that we are more important than they think we are. After a day of discussion, I am wondering whether, in the words of Pogo, "I have seen the enemy and they is us," whether in fact there is a certain dialogue going on here in which we are beginning to convince each other that we have our own internal house to bring in order as well.

We have only two formal speakers this morning, Merilyn Reeves and Frank Shafroth. Then I will ask George Peterson and Warren Wicker, who started our discussion yesterday on the institutional and financial side, simply if they want to add some informal comments. They started first and gave us some generic concerns, and now they sat through the conference, and they have both agreed there may well be some things that they would like to add at the end.

May I introduce Merilyn Reeves of the League of Women Voters.

Biography

MERILYN REEVES

MERILYN B. REEVES is second vice-president of the national League of Women Voters and has an extensive background in energy and natural resources. She chairs the state of Maryland's Hazardous Substances and Low Level Nuclear Waste Council and the Patuxent River Water Quality Public Advisory Council. She has served on the U.S. Department of Energy's Environmental Advisory Committee and on the Maryland and Virginia Chesapeake Bay Legislative Advisory Commission. She was environmental quality chairman and natural resources chairman for the national League of Women Voters and has been active in energy and natural resources programs in the Maryland State and Prince George's County chapters of the league. She holds an M.S. degree from Northern State College, South Dakota.

WATER INVESTMENT IN THE PERSPECTIVE OF SETTING PRIORITIES FOR LOCAL AND REGIONAL PROBLEMS

Merilyn Reeves
League of Women Voters
Laurel, Maryland

I think I would like to begin by looking at the letter sent to me dated August 3, signed by David Marks and quote a couple of sentences to help set the stage for my presentation. It says: "Tremendous investments in new technology and in the water supply infrastructure, as well as major institutional reorganizations to better manage the resources, are needed but not taking place... . How is information about the size of the problem, the available structural and nonstructural solutions and the need for attention brought to regional decision makers who currently consider this problem low on their priority list?"

The League of Women Voters agrees that the problems relating to water are very serious. The solutions will require extensive public discussion and public participation. The issue is too important to be left to utility engineers. The League of Women Voters has felt since the late 1950s that members of our organization have not only a responsibility to be informed about issues pertaining to water resources management in its broadest sense but also a right to participate in decision making. We believe that public understanding and support is a key element in solving water problems, and we believe that this factor is often overlooked or ignored by technicians and engineers who plan or develop what they believe are the best solutions.

I think there was a little of this discussion yesterday as we discussed the problems in California and who should be making decisions. How can the advice of water professionals get out to the public so that it is fully considered in the decision making? How can professionals best build and seek public support? There is no doubt that in the day-to-day give and take of political decision making, public understanding and acceptance of professional recommendations are the determinant factors in problem solving. Gaining public understanding of a problem and securing objective discussion of the alternative solutions are far too important to be left to the last-minute verities of a public hearing process or to a crisis.

I was very intrigued with yesterday's discussion about how the state of New Jersey truly believes it can capitalize on the water shortage crisis that occurred. Crisis is the 2 by 4 that will get the attention of the mule. So we can turn a crisis to an advantage, but even in a crisis there must be public acceptance.

I think history will record that during the 1970s a new dimension or scope was added to our democracy in which a new effort was made to involve public members in the governmental decision-making processes, particularly for environmental issues such as water quality.

No doubt there were failures during the years when public participation was at its zenith. There should be a healthy skepticism whether or not money was well spent that created public advisory bodies, produced slide shows and publications, and consumed the time and energy of professional staff. I cannot justify everything that was done in the name of public participation in the 1970s, but I think we all know that in a democracy we learn by doing. Today we have a great deal of experience to guide us as we begin a new era of involving the public in decision making. There is one thing that members of our organization will not let happen: we will not go back to the old mode in which the public was not really involved in environmental decision making. Although we may see cutbacks in funding, there is a determination by individuals who do not have a vested interest to be involved. We in the league believe that we have a responsibility, and a right, to be informed and to participate in local, state, and national decisions.

In yesterday's presentation, Bob McGarry made it sound so easy to involve the public, establish an advisory committee, and have effective public participation. Those of us who were very close to that effort knew that there were other methods, other advisory committee possibilities, that could have failed miserably had they been instituted. For public participation to succeed, there has to be careful planning from the very beginning. As much attention should be paid to involving the public as is given to the design and construction of a water treatment facility or to the fiscal planning that is necessary before contracts are let. Many times I think that utility executives get so involved with design and construction planning that they forget that they must do the same kind of hard-nosed planning for public participation activities.

What elements are necessary for effective public participation? We believe that there must be access to information. Access does not mean that every single printed word generated about a project is mailed to every single individual in a community. Access is establishing a procedure so people can obtain information easily and in a timely fashion. Access is making certain that condensed versions of lengthy reports are widely circulated and there are opportunities for public discussion prior to formal hearings. Access is making the expert available to answer questions.

In the preparation of reports, make certain that they are written in a manner that the newest elected official in your community will read them and understand the issues. A newly elected individual generally does not have a wealth of background on water issues. Such an individual will not have the time to read a thick, 600-page report. That newest elected official is your canary. If the elected official does not understand the problem, then it is doubtful if he or she will work for solutions. Like the canary, the issue will be dead no matter how urgent it is.

Effective public participation involves not only access but a process for citizens to be informed and to be able to offer their views. Effective public participation is a partnership in which both sides, the utility and the public with all the diverse users, are willing to spend time and energy seeking acceptable solutions to complex problems. For the utility there is a responsibility to recognize that the public is part of the solution.

What was brought up here yesterday and what we all know is that there may be no quick fix, but an effective public participation process should lead to timely decision making. Bob McGarry talked about making decisions during the term of office for elected officials. If they are the ones who have to make the decisions, that is a very good rule of thumb to use, but remember that after a decision is made, there is a continual new generation of leaders, citizens, engineers, and questioners. There has to be some kind of ongoing process to update, review, and evaluate utility projects and needs.

I said that there are no hard and fast rules, and I put in my paper what we thought are some good, common-sense public participation elements. I believe that the utility has to take the responsibility. I think it is the utility who knows the scope of the problems. It is the utility manager who knows how old the pumps are, who knows the status of funding, and who knows if user fees are being diverted to general revenues as was reported yesterday.

Unless that information is made public and explained (it is the responsibility of that utility manager to make certain it is explained and to keep the public informed)--how can problems be solved?

As for establishing formal advisory committees, I believe all of you have had experience with them. Some perhaps may have been fortunate to have had a good experience with an advisory committee, and some have had bad experiences. In our view they are a very necessary evil, if you would like to say that they are an evil. We don't think that they are. I don't know of any way, other than through an advisory committee to bring people together to discuss problems and solve them. An advisory committee should be given responsibility, a succinct task that is doable in a relatively short span of time. It is impossible for a group of individuals to come together in an advisory committee if they don't know who they are supposed to advise or on what issue. Citizens need to know whether they will be meeting for a year, six months or five years, will the committee serve at the whim of a government agency who only wants to call it into a meeting when they have something to report but do not want the committee to have a role other than that.

To establish an advisory committee plan ahead carefully, select the issue. Make the committee responsible not just for giving you advice but for standing up and defending their views. There is sometimes fear that the public advisory body won't agree with the professionals, fear that the public advisory body will come to different conclusions from the utility managers. If the public advisory body comes to different conclusions, it may be likely that an elected body would also come to different conclusions.

The public advisory committee may not be able to agree or reach consensus. No consensus is as important a part of the decision-making process as having a consensus, because it clearly demonstrates that there may be other solutions or alternatives.

Remember that you cannot just set up an advisory body and think the job is over. An advisory committee becomes a part of the establishment. The longer it exists, the more it is a part of the establishment, and the more it is likely that its advice will be challenged. It is important that an ongoing committee have occasional changes in membership and leadership.

Finally, I think that every utility must have a way to provide public information. Does your utility have a means to conduct tours through your drinking water plants so that not only school children but also members of the Ladies Guild, the Rotary Club, or the Sierra Club can go and see your facility to find out what your problems are and how your facility operates? If you cannot afford to set up a go-see trip, you can afford to have a semiannual open house at your drinking water treatment plant. A go-see trip is worth a dozen meetings, and there is no substitute for it.

I do not believe that involving the public should be left to a public relations department. The words "public relations" are now in disfavor and bring to mind a vision that you are trying to sell something, hide something, or manipulate citizens. Citizens want, in the "Dragnet" fashion, to "get the facts," and some do not believe that something called public relations gives facts. Some believe that a public relations department is there to put a very favorable picture on what could be a very serious problem.

Members of the League of Women Voters are very concerned about water issues. We are willing to serve on advisory committees and participate in problem solving activities. League members care very much about their community and that is where there will always be a need for public discussion and public participation.

GENERAL DISCUSSION

QUESTION: Merilyn, one of the problems with advisory committees and public participation is--and I am speaking really from experience--that some people can use them to their own advantage. Let me just give an example in Arlington. I don't know whether you live in Arlington or not, but Arlington is completely dependent upon the Washington water supply for its water. We have two or three pipelines under the Potomac River of treated water over to Arlington, and we have pumps to pump the water over and water tanks for pressure. We are vulnerable in case those pipelines go out. We are vulnerable in case the Washington water treatment plant is sabotaged or goes out of commission, and we have at best a couple of hours of water supply if the pipelines break, and these are piplines you couldn't mend in a couple of hours. So we would be out of water if those things happened, along with all the hazards that that water system has.

So this is not really a formally constituted advisory committee. The water utility managers are aware of that. They engaged a very well-known and reputable consulting engineer to look at the hazards, what ought to be done; and they felt that because of this vulnerability, Arlington ought to have storage of maybe a day's or a day and a half's supply. At considerable cost, a half million dollars or so, they evolved a system of building a storage reservoir that would be at a high point. It would be a fairly large storage reservoir that for most people was unobtrusive on the site of the highest point in the county. This was developed and, you know, the money was available to build it through a bond issue that was sold before they even had the engineering study made.

So then a citizens' participation group was set up to discuss this, and it got completely under the domination of a few people who lived in the vicinity of that storage reservoir who didn't want it. They sent the whole thing back to the drawing boards and got another engineering firm, I guess, and I don't know how they reached the decision, but they decided what we really needed was another pipeline across the Potomac River.

And, you know, if those pipelines under the river go out, it will be because of an earthquake or something, and if you have three instead of two, they will all go out. It is still vulnerable to the

Washington water supply. Of course, the decision was that Washington can't afford to have its water treatment plant go out.

MS. REEVES: All right. This is one of the bitter experiences on citizens' advisory committees where citizens say, "I will never do that again, they will never see me." But I have to ask you what involvement you had with the public as you were trying to relay the fact that you thought there was a problem. You began by saying that Arlington is vulnerable, so a consultant was hired, and the consultant came with a report, and then when the consultant came in with the report, a citizens' advisory committee was set up.

It is too late then because they haven't been involved in saying what the problem is. I think anyone would know that Arlington is not very big. You know your geography, and you knew where that high point of land was all along. There is no utility engineer in the world who won't look at that high point of land as the perfect location for some kind of a water storage facility. You should have known that you were going to get that "not in my neighborhood" reaction simply because it has to be inherent.

I am not second-guessing, but even though I am saying, "Yes, we have some very bitter experiences," I must again stress that, you have to make certain that you have a broad enough constituency of that public if you are going to do a public advisory. And by "broad enough" I do not mean 30 members. That is not the way you broaden it. You broaden it by making certain you have some impeccable expertise, and in this particular metropolitan area that is so easy to find; it is so easy to find an individual with great expertise who is not part of the establishment that will make money off of it because they work for some section of the government. You do not have that everywhere. But you can turn to some of that expertise. Even in small communities you have retired individuals you can turn to who are looked upon as not having a vested interest.

DR. MARKS: If the water engineers have learned any lessons in the last 15 years, it is that you can't narrow your alternatives too early. You can't go with your "engineering judgment" and narrow the alternatives too early. Time and time again, you will end up not having considered the public. We are latecomers. Transportation engineers are watching highways being blown up because we have made some interesting mistakes.

QUESTION: Merilyn, I appreciate the maxims, but let me ask you a question. There is always a danger that a citizens' advisory group, whatever label it has, itself loses contact with the public. It becomes a self-assertive group. Forget the special interests, vested interests. It develops its own expertise, and it may have no contact with the group of people that it ostensibly has been created to represent, in some sense.

What organizational procedure exists by which that group is held accountable? The label "citizens' advisory group" seems to give it some degree of accountability and respectability as opposed to the experts, the water utility managers. How do you ensure that that group retains its character?

MS. REEVES: By the charge of responsibility you give the committee, by the agendas. If it appears that you have individuals who no longer represent the constituency they were supposed to represent, you put an agenda item and make them report on what they have done to go back and talk with their constituency, and you put them on the spot. You ask them, "Are you saying this as just an individual member of your organization or is that the official position of your organization?" You can force that advisory committee to hold public information meetings in which the agency sits in the back row and you put the advisory committee up front, and you make the advisory committee stand the heat, not the agency. There are many devices that can be used to force an advisory committee to be accountable, but it begins with the charge of responsibility.

I don't think that a utility really has anything to fear if you have done a good job of looking over your base of individuals who can perform and help in putting them up front. Either the advisory committee will gain so much credibility as a result of conducting public information meetings or being forced to do this that the utility will have to look very hard at their proposals, or, if the utility doesn't want to look hard at their proposals, they might end up running the show, and you have to take that risk.

But at the same time, I think an advisory body has to have some clear responsibility and has to have some accountability and be held to it. Where you have run-away advisory committees that go on and on or where you have them dominated--and I have seen them, I have been on them when they are dominated by one or two interests--you must figure out a way to do it. You create the advisory committee, you can "uncreate" it.

QUESTION: Based upon your experience, what is the maximum length of life for an advisory committee? Because it is my impression that people in America serve on advisory committees and give a lot of good service for about a year or two, but at about the end of the second year, they start saying they really need a new manager, or they want to fire the staff, or they want to get into the operations and management business. People don't like to plan for very long. They are not content with that. How do you deal with that problem?

MS. REEVES: I don't know how I deal with it. I can just tell you that my most satisfying experiences were ones which dealt with a particular problem which happened. I am going to cite two experiences. One was with the construction of an interstate highway that would go beyond the Beltway into the District of Columbia, so the task was very clear. We knew what it was we were supposed to be giving advice about. There were highly polarized views on that, and that is part of it. You put those polarized views against each other. If there isn't an interaction with polarized views, all you are doing is having a citizens' advisory committee taking potshots at who created them. They haven't done anything.

So you have to get these forces working at each other. It has to be something in which from the very beginning you know when the decision is going to be made and you work toward that decision. And let me tell you, you will be in agreement. It might end up in court, but at the end of it. The second satisfying experience, from my view, occurred when I was serving on the committee Bob McGarry described so well yesterday--and that was the first committee, the one where the scenarios were developed, the one where John Boland helped provide some expertise. I was very impressed with that committee because of the expertise that had been tapped to serve on it. I have served on many, many committees where they were all very uniformed, and suddenly I was with people who really did have non-aligned expertise that I listened to very carefully, and it made a great deal of difference. The most frustrating committee I have ever served on is one I still serve on, dealing with water quality planning under the 208 and the 303E of PL 92-500, which will never end, never, and it has done more to destroy the credibility of advisory committees, in my view, in water than almost any other thing.

But at the same time, there were a large number of us across this country, really thousands of individuals, who spent thousands of hours serving on these things, and the real problem was that we never had anything to sink our teeth into. It was planning, and planning never ends, you know, it goes on forever. So there is no satisfaction on my part as a citizen. I wanted to plan for the 201 process. It tells you when to build a wastewater treatment plant. Well, nobody wanted you to plan for that; oh, no, they wanted you to do the other planning so they could go on with it.

QUESTION: I guess we do things differently out in the short grass country. We don't have very many advisory committees, and I think part of the reason is that the management of small-town utilities have developed a situation where the public has confidence in them. As a good example, for instance, consider budget time. The newspapers have stories about the budget--up or down, whatever--and I have seen hearings year after year after year where no one would come. When I served for six years as mayor, I even called people up and asked them to come to the budget hearing to find out what we are doing. No one showed up. So what we have done, and I was instrumental in doing this several years ago, to assist management in making decisions is that we went before the legislature.

Mr. Peterson, I believe, was discussing the bond situation. We have under state law now for the issuance of revenue bonds a procedure where the governing body passes a resolution of an intent to issue the bonds, and 20 percent of the voters in the previous election have only 15 days to file a petition, a protest petition. That will only bring on an election. Now, in our state I don't recall a single instance in the last 15 years where we have had a protest election. We make it possible for management, after they have made their decision, to proceed immediately. Now, that may be undemocratic, I don't know.

MS. REEVES: I think you brought to this discussion one word that is very important, and that is the word "credibility." The public believes that it has safe drinking water, and I hope that you are secure in the knowledge of your water sources and that your system can continue to provide this. What we are finding is that the public is losing confidence, and let me tell you, when the public loses the confidence, it will happen very quickly and it will happen from a series of very disastrous kinds of events, as, for example, in the Tylenol case.

It will be very hard for any water system to regain that public confidence and that public credibility that they do have, and then you have a problem. The public involvement invariably is extremely important when you have a crisis or an identified problem, and I think that is why I read the discussion questions. There appears to be a need in this country that we have an infrastructure problem and it is lying there vacant, it is lying there dormant, and how do we get this information out? Maybe in your community it is okay to lie there dormant. Maybe you are going to have all the money you need to take care of this. But that is not the case in other places across the country, as evidenced by the extreme issues.

DR. MARKS: I would agree with you 100 percent, and I would take issue with you. What we heard yesterday is that people see crisis as opportunity to do things they couldn't otherwise do, and I think this is a pretty universal view throughout a profession who feels that you can't get attention, that you are competing with so many other concerns, and that a crisis often brings you attention and credibility. Finally you are in the limelight and you can get together some things you thought have been important: could that pipeline have been built across the Bay Bridge, could it have been planned as a contingency measure before the event?

MS. REEVES: But if you have the situation he describes where you can't get people to come to a meeting and no one is interested, there is obviously no perception of there being a problem. Now, if there is a problem--however, he describes a situation in which he seems to have funding without any difficulty, and if there is no problem, I am not so sure that if I am a citizen, I should even be interested.

DR. MARKS: This brings back a larger issue. The question is, How do we get people's attention? We seem to think we need a crisis. I won't quote the senior New Jersey official whom I asked one time whether he thought the New Jersey drought would end very soon, and he said he hoped it didn't end too soon, because it would be a chance for them to put through that big bond issue and to get some things they thought they needed. Whether you are doing flood planning or water supply planning, you pray for these extreme events, which don't come too often, which remind people that they can occur so that you can get things done.

Are we going to have to operate on this kind of crisis mode, first of all, and second, does anyone realistically think one can plan for these rather radical things that occur quickly during a crisis?

QUESTION: Someone said yesterday, in talking about some water issue, that every situation is unique. The British have an expression "courses for courses." What you describe in this area is perhaps characteristic of the populace here. You have very well educated, very concerned people who have migrated to Washington to be a part of the action, the federal action, and so you have a great concern when anything comes up. I live in a university community, and you have professors and professors' spouses, and everyone is really au courant with all of the issues. They all show up. If you get to a community, on the other hand, perhaps 100 miles from Chapel Hill, in our case, you get to a small community in southern Virginia, perhaps, you won't have nearly the level of public concern unless there is a special crisis. So long as the water utility manager in that community in southern Virginia is doing his job, no one will be very much concerned.

So you will have less credibility, but not because the manager is any less competent; you have many more people who have time to be critical, who realize that there are many other options, and who just don't let the utility manager, no matter how competent, go his own way, because they feel they have a role to play.

MS. REEVES: I cited my own experience when it was asked what did I see as things that pertain to advisory committees, but when it comes to service on advisory committees, I am really articulating the concerns that league members across the country have felt and the frustration that has been felt and the fact that there are no easy answers. And yet, truly, advisory committees are still needed. So in the very generic sense, you find that if there is a problem and if the public doesn't know that there is a problem and the utility knows that there is a problem, I think that utility had better start getting together a small group of individuals in an informal way to start talking about that problem. At least you will begin the public education that might take years before anything happens. But I don't think we have to wait for a crisis to dictate how we should handle this.

QUESTION: Shouldn't the utility manager have a little bit of politician in his blood?

MS. REEVES: Shouldn't we all? Shouldn't we all have just a little bit of politician in our blood? Isn't that what democracy is all about?

DR. MARKS: Thank you Merilyn. Frank Shafroth is here from the League of Cities and he is our next speaker.

Biography

FRANK SHAFROTH

FRANK SHAFROTH is an attorney with the National League of Cities, working on matters related to transportation, energy, and the environment. Before joining the staff of the league, he worked with Congresswoman Gladys Spellman and with Senator John Heinz and served for two years as assistant counsel for the Senate Subcommittee on Housing and Urban Affairs. He is a graduate of Georgetown University Law School.

WATER INVESTMENT IN THE PERSPECTIVE OF SETTING PRIORITIES FOR LOCAL AND REGIONAL PROBLEMS

Frank Shafroth
National League of Cities
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I have only one qualification for speaking to you this morning as a nonengineer or a nontechnical expert. I think that I am probably the only individual in this room who has constructed, owned, and operated his own water supply system.

I lived in West Africa for two and a half years. About a day after I had been there, I realized that I didn't have any water. I watched children go down to the waterside, which was about half a mile down, and take a big washbasin, put it on their heads, and carry the water back. So I got out my washbasin, I walked down to waterside, I filled it up and couldn't lift the washbasin. In any case, the water wasn't the cleanest water you have ever seen.

So I decided I had better build a water system--which I did--to collect rainwater on my roof. I did have to take into account, well before Bob McGarry came to Washington Suburban Sanitary Commission, a risk analysis system because where I lived there was about 200 inches of rainfall a year but it all occurred between March 18 and November 18. The second or third week of November was the last rain until the first rain in March, and believe me, during November, December, January, and February you used water very carefully, or it was back down to trying to carry that bucket of water up.

I wanted to give you a perspective this morning of what the National League of Cities is and what it does. We are an organization that represents directly 1,000 cities. And when I say cities, I mean either the mayor or a member of the elected city council, not technical people within the city. Indirectly we represent 15,000 cities. By that I mean that we have 50 state organizations that represent state municipal associations. For instance, the Iowa Municipal Association has 998 members, and I think the director told me that the smallest member city in Iowa has 98 people. So they do go small.

Our task, and particularly mine, is dual. It is partly informational, advising members not only on what is going on in Congress, but also on issues which affect cities of which we think our members should be aware. The other side of our organization is to reflect the concerns of municipalities of all sizes around the country. One area over time, obviously, has been water.

I tried to lay out for you in the paper a number of the major concerns we have now. I started out by saying that particularly over the last few years, water supply crises have been a growing problem for all kinds of cities. The issue is not necessarily that water is going to run out but rather that the water quality may not be sufficient for municipal purposes. If it is not, that does create a crisis and forces some other means for water to be acquired, especially for drinking purposes.

We find that cities are ill equipped, for a variety of reasons, to respond to that crisis. That is not distinct from the thesis we heard both this morning and yesterday. The first question is why. If you think about local politicians--and I would say 80 percent of our members hold full-time jobs in the private sector and the other 20 percent of their time is spent as a mayor or a local city councilman--in almost no case are they water experts in any manner or form; they are politicians solely. What they will do is respond to people who come to them and advise them, and create in them a sense of the urgency of the problem that must be dealt with through the political process.

I think, from my perspective, it is reasonable to assume that for many municipalities, then, economic benefits, some sort of a water crisis, and institutional biases built in at the federal level have driven public policy with regard to water supply. It has been the exception rather than the rule that public policy is a reflection of public needs and the public planning process.

The nature of water supply problems right now, as perceived by our members, is threefold: financial, institutional, and technical. I think George Peterson yesterday morning laid out some of the financial problems. They are being better and better documented each day. They also relate to water quality, which is an area that is not documented; it is an area, for our members, of much greater concern. They are institutional, and by institutional I mean that there are a large number of federal agencies that have a role in dealing with urban water supply problems.

I thought I would tell you some of the specific areas in which our association is working to deal with some of our perceived problems in the urban water supply area. One major concern is financial. It has been especially difficult, from the numbers we have seen, to really respond to infrastructure needs. That is obviously broader than water supply and water treatment. For local governments to pay the costs themselves would be approximately a 40 percent property tax increase for every taxpayer in the country. I do not think I need to tell you how many local elected politicians would like to campaign on a platform of increasing your property taxes by 40 percent next year, and I know that I do not need to tell you how many of those would be elected. That will not be an alternative.

One method by which many municipalities and most of you have raised your money to build your water supply systems and water treatment plant where you have joint authority is through tax-exempt financing. That is an area we have spent a lot of time on with the White House and the Department of Treasury last year. Revenue bonds by quasi-independent statutory authority for nontraditional, i.e., noninfrastructure, purposes have become the norm in this country, while governmental issues repaid with tax revenues for basic public facilities such as water supply have become the exceptions. The Treasury loss for those nonpublic purpose infrastructure uses from the use of tax-exempt financing exceeded $1 billion last year. Revenue bonds as a share of the market grew rapidly through the 1970s. In 1979 they totalled $6 billion; in 1980, over $40 billion. During that same period, government obligation bonds went from a total of $12 billion in 1970 to about $15 billion in 1980.

One of the areas we are looking at is trying in some way to restrict that market of tax-exempt financing so that it is available only for public purposes, especially for infrastructure needs. But I can tell you, within our organization that effort creates intense animosities. Moreover, last year our organization, representing public elected officials, had a very lonely battle on this issue and was not supported by the Conference of Mayors and the National Association of Counties, the governors, or other public elected official interest groups in Washington.

Part of the concern I can see when our members talk--and this year we have undertaken an extensive effort to educate the members of our steering committees who set our policy. One could see that once we went out of our Fiscal Affairs Committee and tried to present some of these tax-exempt bond issues to our Energy and Environment Committee, which has to deal with pollution control financing, among other items, and started discussing limiting the way local governments could issue tax-exempt bonds, especially industrial development bonds, there was controversy. One member of the Energy and Environment steering committee works with a public utility that generates electricity in the Midwest. He said if that utility could not issue Industrial Development Bonds, they would increase rates 30 to 40 percent next year and would have a revolution on their hands.

So we went around the table. You saw these elected officials reflecting, from both their private sector capacity and some of their public sector capacity, strong opposition to any limitations on the use of tax-exempt financing. The strongest concern I have seen is the conception that local public officials and state public officials feel that tax-exempt financing is a tool that should be uniquely available at their level of government to use for what they perceive are public purposes. It is difficult to reconcile the cost to the federal treasury over a program with no defined and accepted general public purposes. It is only when you are forced to make some balance or some choice, even at some cost to yourself, that you will make the decision as to what your priorities are at the state and local level.

There is another area which we have spent some time on. That is, we are trying to create, especially for groundwater, a much better coordination of federal roles. In this we work closely with the National Conference of State Legislators and the National Governors Association and the National Association of Counties, to create a coordinating council. In the view of these public interest groups, the consensus is that the National Academy of Sciences would be a very good host or leader for this effort. We feel that this is an area that is largely unknown: very few data, immense research needs. It is an area, I can tell you, for public elected officials at the local level that is the single greatest, growing concern.

Until now, groundwater has in some ways been the epitome, I think, of the way we have treated any public water infrastructure in this country. Groundwater comes up, it looks clean, it tastes good, it is there, it is very inexpensive to put out at the tap. It is only in the last decade that it has become clear that just because it looks good and tastes good, it is not necessarily safe. It is the sort of crisis that can become very dangerous after the fact.

This is an area where the coordination between those federal agencies that are directly involved is not good. It is a growing concern of ours, and we would very much like to see some sort of coordinating council so that at least at the federal level we know where the gaps are, and where the work is being done; only this knowledge will enable us to avoid needless duplications.

By the same token, we are very concerned about improved and increased research on monitoring drinking water contamination. We think better protection of watersheds and recharge areas is important. Until we can understand what is in water and know how to deal with it, we would like to protect what is there.

Now, I started with a thesis that a lot of public policy at the local level is driven by economic benefits or emergencies. If you are going to build a large dam somewhere near your congressional district, that will create a lot of new jobs. So you want to build a dam. It is not necessarily related to your needs; it is related to the fact that a lot of money will come into the city or district. Similarly, you might do something in response to a crisis. I think Paul demonstrated that very well yesterday with regard to New Jersey.

I am not sure if in the future, particularly in the water supply and water quality areas, we can afford to wait for crises to help us shape public policy. I was fortunate when I dealt with Bob McGarry, both in his role with the Corps and with Washington Suburban Sanitary Commission for five years. He spent a lot of time with the members of Congress from the Washington metropolitan area and with the elected local officials.

It paid off because they knew who he was, they knew the facilities he dealt with, and they had some understanding of the problem and some understanding of how important it was that they react before the crisis hit them. It is a safe bet that no public elected official wants to lose office because that accident occurred while he or she was in office and it could have been avoided.

But he or she will only react to the extent that you make him or her aware of the importance of avoiding that. You do what Bob McGarry did. You take in a well-documented memorandum that states the potential for a crisis and what can be done, or at least that it is going to be your responsibility, because there is a 20 percent chance or a 10 percent chance or a 5 percent chance that such a crisis will occur; and if you want to make the decision that a 5 percent chance is an acceptable risk, fine.

But that elected official must be made aware of what the risk is, or it is not necessarily reasonable to expect him to act in what you feel is the public interest.

GENERAL DISCUSSION

QUESTION: I would have one observation, Frank, starting with the right-to-know ordinance about toxics, where they are stored in the factory and in the workplace. One of the problems we are running into is the fact that at the federal level you meet those regulations, and the hell with the city's. That is a real struggle at the Department of Transportation, and the city can't have anything to supersede that, as part of the battle, again, of Washington knowing it all and local authorities not being able to effectively deal with the problem.

MR. SHAFROTH: That has been part of the effort, and we are meeting with industry, and industry agrees with us that the federal regulations in some cases are inadequate and there ought to be some flexibility for the city of Cincinnati to go beyond that as long as what the city of Cincinnati does will not conflict with what adjacent communities do. Part of what we are going to do is to try some regionalization in that area because we feel that that is an important value, and of course the industry feels that it is very important that they not have a separate set of rules in every locality in the country.

QUESTION: On that same issue--we are now constructing a hazardous waste landfill in Maryland. We had legislation enacted last year that gives the Department of Transportation some authority over the moving of hazardous materials. There may or may not be some legal question about their authority to do that, but the industry itself--the generators and haulers of hazardous waste--recognizes that some kind of control is absolutely essential.

So I think even if it turns out that there is some flaw in the authority of the state to direct it, I doubt very much if it will be challenged, because the people who are going to benefit from that in terms, partly, of improved public credibility are those who would likely challenge it, and that would be self-defeating.

MR. SHAFROTH: This effort in hazardous materials commenced because a year ago the American Trucking Association convinced Senator Danforth to offer statutory language to totally preempt the authority of any state or local government to regulate hazardous materials. We were successful in having that amendment withdrawn, and then the industry decided that maybe we ought to talk to state and local governments instead of trying to preempt them. We are in that process now, and I think we will reach a conclusion, which, of course, is better regionalization. It provides money so there is planning and training and much better capacity at the state and local level to respond to an accident when it occurs instead of having that happen after the fact.

QUESTION: I feel for the police chief or fire chief in Charlotte because it could be, and it might not have been the case, that his boss or superior, when approached with the idea that they should talk to the City Council about problems, quashed it completely and said, "Oh no, don't do anything like that, that will cause trouble." It may well be that the decision maker, the person with the information or experience about a problem, can't get to that body you are talking about for one reason or another because of ineffective communication or because of political fear that there will be a problem. I don't really know how to combat that except by whistle blowing, and whistle blowing is frowned on even in the highest of circles.

MR. SHAFROTH: I think that is true in some cases. Someone here said everyone needs to be a little bit of a politician, and I would simply repeat that if you are able to put on a piece of paper something in which the risk is important enough, I would think that someone superior to you in an intervening layer would be reluctant to bear the burden after the accident occurred. The other thing that is safe to say is that every bureaucrat wants to avoid holding the hot potato when the crisis comes. We want someone else to bear that responsibility.

QUESTION: Would you care to elaborate on your comment that the highest single public concern of people you are working with is the quality of groundwater? What is the basis for that?

MR. SHAFROTH: I didn't mean it was the highest single concern, but that it is becoming the largest concern for the people I work with. The basis is finding water contamination in a lot of communities that rely on groundwater for drinking water purposes and finding a number of things. When they find out, for example, that there is contamination, they are not sure what that contamination means or how much of a risk that contamination is. They find that from different states they are getting different answers. From EPA often they are getting no answers.

It creates a secondary layer of problems. That is particularly well demonstrated in San Jose, California. One of the semiconductor chip makers is putting effluent into the groundwater there. They found nine wells that are contaminated. So the city officers decided that they would then create their own standards for groundwater monitoring, and industry pretty much agreed.

But they discovered soon thereafter that the adjacent county decided that it needed some standards, but that it wouldn't make its standards as strict, so any new semiconductor industry moving into the area will not want to be in San Jose but rather would want to be in the adjacent county. So another thing brought up is that competitive process of whoever has the lightest standards might be in a position to economically benefit. That puts the city council in a difficult position. How do you balance how much you want industry to come in and bring jobs, especially during a recession, versus the risk you are willing to impose upon the consuming public?

QUESTION: It seems to me that that is a clear violation. The situations you describe are clear violations of almost every state law in the country. I don't believe you can contaminate groundwater with wastes from any of these industries you are talking about without running afoul of state law.

I think there are some instances, especially along the East Coast and California, where what you say is true, but I had occasion to look at the examination of all of the public water supplies in 17 western states. EPA had done a scan on priority pollutants on all of those. We are talking about public water supplies, and they didn't find a single public water supply system in which the levels of contamination were above the permissible. There are some on the East Coast, but they are well publicized.

MR. SHAFROTH: I am surprised to hear that, number one; and number two, I know the Mayor of San Jose spent a lot of time meeting with regional and state and federal officials to find out what she could do, and there were no laws at the time to deal with that. Most of the law dealing with groundwater contamination has been common law.

QUESTION: There's a difference between detecting a pollutant in groundwater and having that constitute a significant health risk. However, in the public's mind and in the minds of the editorial writers, there is no difference. As we detect pollutants with ever more precise instruments, the presence of pollutants is something the public is going to have to live with.

MR. SHAFROTH: I think that is pretty much on point. For instance, the Mayor of San Jose has got to deal with the press, and as you said, the press is very up in arms, so she has to respond publicly and quickly. I doubt whether all of you have enough knowledge yet to deal with that. That is why I say that one of the areas that we think is most important now in the toxic area is much better research so that a mayor can get up and say, "Yes, there are contaminants in this water, but I can tell you that that level is safe."

QUESTION: You can't ever say that. That is the problem. You can do all of the research in the world concerning contaminants and you won't be able to make that statement.

MR. SHAFROTH: You won't be able to make it in a failsafe method, but you will be able to do what Bob McGarry did in terms of some level of risk assessment.

QUESTION: Those are two different issues. Risk assessment with regard to groundwater contamination is different from risk assessment with regard to frequency and availability of water. Those are two separate issues.

MR. SHAFROTH: I don't think I fully agree, because as you say, you will never be able to say with 100 percent certainty that there is no risk if some contaminants are found in the water. So what you have to do is educate the media and the public and say that according to your best knowledge this is what it means. However, if right now an elected official goes to one state and asks if a certain level of TCE in parts per billion is safe, he is told that it is safe. When he goes to the adjacent state, he is told that the level is much too high, that it is very dangerous, and that they should not be drinking that water. Then the official goes to EPA, and EPA says they don't think that that's safe, but they don't know. Now, you tell me, if you are the mayor or that local elected official, and you have the press covering this very well, what you are going to do.

QUESTION: Your point is well taken. From the state level, we have made the assumption that we are going to operate as a state at the local level. Point of correction. There was one contaminated well in San Jose. There were nine sites where tanks have leaked. They have not contaminated the groundwater or drinking water, but they have leaks, so there is a demonstrable chemical in the groundwater from the leaking tank issue, if you will. And remarkably enough, that is a hole in the regulatory process. No one apparently regulates buried tanks and or pipelines. We are moving as fast as we can to regulate it.

MR. SHAFROTH: No, let's keep it in.

QUESTION: But there we have a crisis because some want it below ground and people like us want it above ground, so we are going to put it halfway.

QUESTION: But the problem here, and it is an engineering problem, is that the water supply people in the community I work and live in have deceived themselves over the years that groundwater is pure and pristine and as long as you have a good well, there is no problem. Au contraire. The groundwater pollution problems in California and in the rest of the states are of a large magnitude.

DR. MARKS: Thank you Frank. We have Joan Warren here from the National Governors Association, and I would like to ask her for her viewpoints this morning.

Biography

JOAN WARREN

JOAN WARREN is senior staff associate for water resources of the Committee on Energy and Environment of the National Governors' Association, working on issues related to water quality and resource development and groundwater management and protection. Before joining the National Governors' Association, she was on the staff of the Office of Governmental Relations of EPA, working with state and local governments and public interest groups on EPA's water and waste management programs. She has also worked for the National Conference of State Legislatures, dealing with environmental issues. She holds an M.A. in political science from the University of Florida and is completing work on her Ph.D.

GENERAL COMMENTS

Joan Warren
National Governors' Association
Washington, D.C.

Actually, I just wish to mention groundwater contamination as it affects drinking water. I think there is a lot of misinformation and a lot of noninformation. The problem lies in the lack of financial resources to get the job done. Frank and I have discussed groundwater monitoring many times recently. We do not even have the basic information to know what the nature and extent of the problem is. Groundwater monitoring, as I understand it, is an extremely expensive activity, and even when you have the money, you are not sure you are getting the right information. Who is going to pay for this?

It is pretty clear right now that we cannot look to the federal government to help state and local governments with this problem. In many, many cases, you are talking about $500,000, $2 million, and $3 million, depending upon the site, the problem, and so forth. That is a lot of money.

QUESTION: Just a comment about your last comment. I think it has to be put into perspective. We are still funding the National Pollution Control cleanup effort at the rate of $2.5 billion a year, and by any comparison, you could have a very effective nationwide monitoring program for a small percentage of that. In fact, one of the disappointments to me in the current budget priorities of this administration has been that they have cut the resources for water, which is the area they should have maintained or increased, and reduced a few dollars in the grant area a little faster. That's an area where we need a lot of information, and it isn't that expensive.

DR. MARKS: Part of what I hear here is, what do you do with that information once you have it?

QUESTION: That is true, too. There are many facets to the problem. The problem of the mayor and the regulatory agency trying to give a go, no-go response, is it safe or not safe, is one very difficult problem, but there is another one that faces people in our position, and that is that the presence of these chemicals is symptomatic of a contamination of recharge areas, and this is a national problem that goes back to the early days of our field, that requires the sanitary survey. You only learn the least bit by the monitoring. You learn a lot more by examining the sources of the material, and that is where you can make the biggest impact on preventing additional pollution in the future or trying to identify it in the case of groundwater recharge areas, or in the case of surface water watershed areas that up to now are reasonably well protected, and trying to see that such activities as take place do not lead to some damage in the future. There is a major difference between the groundwater and the surface water, and once the groundwater aquifer is contaminated, once you have allowed a kind of industrial development in a recharge area, which may be many miles away from the well, cleansing that aquifer is virtually impossible. Time may be in terms of centuries. Once you have made this mistake in a river, perhaps you can correct it, and it will clean itself in a year or two.

MR. SHAFROTH: Although it is not that different, as the gentleman in the back said, what they are doing now is that they are regulating those tanks in that area, because there was a loophole there, and I don't think you will see that problem in northern California, at least. It is hoped that some of the mayor's colleagues are going to worry about that in their areas.

QUESTION: But part of the problem, as Dwight says, is that we know that any tank that has been built, that is in the waterline, will leak, and the question is whether that tank should be in that area in the first place. The land use planners or the zoning laws, as well as national land use planning, have been notable for their lack of success, and I think we have a basis now for urging upon our governments and our citizens' groups and others to move a lot more in trying to protect, because time is not on our side. Every time a development takes place, it is pretty difficult to undevelop an area, and we have relatively few areas left that can be considered in any way protected today. We have to identify those and husband those for the future. So this is an opportunity, and I think this is one of the things that might come out of such a conference as this.

MS. WARREN: I would like to say just a little bit about what the governors' concerns are in terms of urban water supply, but I guess it is like the joke I believe you mentioned yesterday, the one about having ahold of an elephant, but a different part of the elephant. Frank's people are much more immediately concerned with urban water supply systems, wastewater treatment, or groundwater contamination than are the governors.

The governors are just now beginning to realize the whole incredible financial responsibilities that the states must take on in terms of infrastructure problems, not just water, but highways and bridges and all kinds of things where federal funding will no longer be available. Like Frank's mayors, I think most governors are not water professionals. I know of several who are intimately involved and interested in water, but they happen to be western governors, and they are very concerned about water allocation and water resource issues, so that they tend to concentrate by and large on these issues.

The National Governors' Association is just now beginning to launch into a project of how to deal with decaying infrastructure problems. Where will we get the money? I have worked in water issues for quite a while. I worked with the National Conference of State Legislatures for a while, and I worked at the Environmental Protection Agency for a while. I know that the states have been interested in water financing issues, initially spurred by some of the actions of the Carter administration, when there was a halt to western water projects, and, at the same time, we had the recognition on the part of the eastern states of the decaying infrastructure. This latter group wondered why they could not get a part of that money or get a comparable amount of money. It was the whole equity question of the western water projects to the eastern water projects.

So then when the Dominici-Moynihan approach was first proposed, which I am sure many of you are familiar with, a lot of us thought it was very attractive. Many of my governors did not think it attractive, because they thought 25 percent state nonfederal cost share was outrageous. They would be very grateful to see that right now. There was great stalling on doing anything with it. Everyone is continually looking for so-called "creative, innovative financing." I think this is a euphemism for easy money, and I think most of us realize that there is no easy money and that it all comes from the same source. The question is, How do you marshal it, how do you get public support for spending money on a certain type of project?

I know that some states have capital budgets. I do not know how many, but there have been proposals at the federal level to establish a national capital budget that would somehow deal with the problem of limited resources and how to prioritize projects that federal tax dollars go towards. Some states are doing that. They are in the beginning stages of trying to prioritize projects, and it remains to be seen how that will work out.

Before, when we thought we had a lot of money, we did not pay that much attention to the competition. Increasingly, we are paying attention to that competition, to who makes those decisions and how, and to the question of how you deal with the problem George Peterson mentioned yesterday. It is one I have been dealing with, not so much with infrastructure, but just in terms of states funding the management of their environmental programs. Where do they get the money with federal revenue being cut off (which is not very much money to begin with)? What do you do about permit fees and user charges? Many states have constitutional or other statutory prohibitions against dedicating or earmarking those funds automatically, which acts as a deterrent in trying to collect those funds. The same situation exists with the infrastructure. If they spend all of this time collecting money and it is going to be spent for potholes, why bother to collect it in the first place?

All I have done is raise a lot of questions and problems--I have given no answers--but those are obviously the issues you are dealing with. I think that we all need to work with state and local public officials on an ongoing basis to keep them apprised of what the problems and issues are, so that when we do get to these crisis situations, we will have the people in place and the networks in place to at least alleviate the problems somewhat.

DR. MARKS: George, this shouldn't come as too much of a shock to you. I promised I would call on you this morning. It seems to me one of the issues Joan raised was the financing issue, and you spoke yesterday morning about generic financing, and you said this is "creative financing."

GENERAL COMMENTS BY MR. PETERSON

I did want to return to one of the hooks you used to get us here, which was the daunting scale of the capital needs. I think the discussions have identified a mismatch between what the profession is doing and what the public perception of the issue is, and I would like to mention it briefly.

My interpretation of the question you posed at the beginning was: in view of the claims as to the scale of capital needs, should the public be taking them seriously, and should taxpayers be willing to pay the price in competition with other requirements to meet those capital needs?

From my perspective, I wanted to see how professional water managers judge the needs estimate themselves, and how much flexibility you thought there was for scaling down capital requirements.

Much of our discussion has divided water issues into quality, supply, and distribution. On the quality side, you have a lot of problems, but by and large they are not capital investment problems. On the supply side, I have found the promise of getting cost-saving professional advice immensely encouraging. The example of the Washington Suburban Sanitary Commission's ability to identify and manage risk so as to lower capital investment requirements is very hopeful.

We heard yesterday that two-thirds of the capital needs of water systems, however, are in the pipe or distribution network. If you take the Intergovernmental Task Force report, a federal study of a couple of years ago, three-fourths of the estimated needs are for replacing old pipe. The replacement rules that are being used in the federal studies and city planning documents are very simple-minded ones. They say pipe has to be replaced after X years--in the city of Buffalo the pipe has to be replaced after 70 years. In Boston, it is 90 years. In some other places, it is 100 years or longer. If you just use a simple rule of thumb like this, you will generate gigantic, sometimes paralyzing numbers. I confess I feel that we have not received much guidance in this area as to how we should rethink these capital needs and whether we should be taking these numbers seriously or not.

It seems to me that there is a parallel with the standards issue. Do we have, and do we need, a standard for pipe replacement? American

Water Works Association has had some standards. What are they? Sixty-seven years for the useful life of cast iron pipe. We know replacement is not taking place at anything resembling that rate in most cities. Is that a problem? The gigantic needs estimates come from applying these rules of thumb about how much of the current distribution system needs replacement. Cannot the profession give us some guidance whether these are bogus numbers or genuine numbers?

If you look at management practice, what we are doing in almost every city is replacing pipeline when it breaks. What is being recommended in these national studies, the city studies, and these magazine articles on capital infrastructure requirements is to replace on an age base, so that all pipes will not go beyond a certain age.

What the nonprofessional public would like to look for is some information as to what, given cost constraints, is a realistic national repair strategy.

From an outsider's point of view, looking mostly at capital budgets, it seems to me that there are really two issues and one possible research question. The first issue is the mismatch between the way system managers look at repair and replacement decisions and the way national policy discussions--and proposed federal legislation--look at them. Is there any way in which local professional experience can help us grasp the scale of the national problem?

Second, on the management side, how close are we to being able to come up with something that will reduce the scale of capital reinvestment requirements to parallel what we are doing to reduce the size of water supply investments? Are there other management alternatives, and does the policy of replacing it as it breaks need reevaluation, or is it one that we can live with for the next generation?

And the research question is this: Given that our largest dollar commitment over coming decades will be to replacing and repairing old distribution networks, is there any systematic collection of information and analysis that can help us identify more efficient, less costly ways to carry out the replacement task?

GENERAL DISCUSSION

QUESTION: I thought the Urban Institute had a project initiated about three years ago that would have answered some of the questions you just raised.

QUESTION: Well, we do--it is a nonprofessional response, obviously, but I think probably my answer, which is implicit in the way I raised the question, is that I think you are operating with a vastly exaggerated capital need. I think it is illustrative of what is happening across the board in these functional areas. It seems to me that for at least the next decade, and perhaps longer than that, for anything that goes greatly beyond replacing pipe as it breaks or in areas of most catastrophic consequences, some sort of advanced planning is financially unrealistic, and, from what I have heard here, perhaps professionally undesirable. Or we don't know the answer to whether it is professionally desirable or not, but we have a potential there for scaling down the size of the capital investment. If you look at this $3 trillion financing cap across the board in functions, a large part of it will come by deflating the estimates in two ways, part of it lowering standards, part of it living with more realistic management practices, such as where we can save money. Only the residual will have to be raised on the financing side for the new taxes.

And I think that the great consolation from this effort is that it doesn't have to be always from new financing. But there is also the inherent danger in this period of unprecedented public interest that everyone in the world, as we have said here several times, knows we will not finance $3 trillion of investment. It can induce paralysis.

QUESTION: Manchester was one of the ten cities that were originally looked at in that proposal, in what they were trying to develop. I believe it is the utility's responsibility to maintain a continuing and ongoing capital improvement program to deal with such situations. I don't believe that you replace a main only because it is leaking. It perhaps could be undersized over a number of years, and we do a lot of that replacement. We also go into areas of replacement where, you know, there is going to be major street rebuilding, and so forth, because that is a convenient time for everyone costwise to deal with it.

I think that what happened as part of that study is that the worst cases were clearly identified, and in my personal feeling, the worst cases are those where the systems were totally neglected. I would be irresponsible and my predecessors would have been irresponsible to not deal with a continuing improvement program. We were in a situation where we could deal with it, but those situations I still say will not be solved by pouring $1 billion into these systems. It will not solve the problem. It will just postpone it, because they will have the same problem again unless they have sound utility management, which goes into your second question.

Although I would take every dollar the federal government gave me, I don't go looking for it, because with it go certain constraints that I don't believe the water industry wants to be involved in. How you deal with situations, specifications, and so forth. I would prefer that the industry solve its own problems. I agree with you. Regarding the numbers they are talking about in replacement, there are mains in Paris that are 200 or 300 years old, with proper maintenance, proper leak surveys, and proper installation.

One of the problems we have not addressed here that I think the industry will face and is facing now is the theory that cheaper is better in specifications, in kind of materials. I think we will create more problems by dealing with that. We see that more and more with statements such as, "Well, we can make this product for you," or "We can provide this for you," or "It will cost you less money." But it isn't to a standard that we used to live with 15 or 20 years ago, and that is the problem that we have right now. Someone will be sitting in this room or another building 15 or 20 years from now worrying about that problem, because that is serious.

On the supply side, I think you are finding Bob McGarry's situation occurring in more and more utilities where they are looking to postpone capital improvement. I don't like the term "conservation," but by using the water wisely I think that is happening. You are seeing people looking and spending more time in research in their own facilities, and that is why it is important for this technology transfer to discover better ways to treat water, and how to do it more economically.

As for hydro in the northeast--we have generated our own power since the 1930s. More and more utilities are beginning to do that. But there needs to be that transfer of information.

QUESTION: Right. On the other hand, when we hear about water quality, there are success stories in this room today. Eleven stations are monitoring the Ohio River every day. Certainly that is a success story. We don't hear much about it. And we are going to do the same thing on the Great Miami Aquifer, a consortium of about six cities and the industry. We paint industry as bad, and yet industry is involved extensively. These are the things we have to learn to talk about.

DR. MARKS: Certainly, needs surveys have not served us well, have they? They are done quickly, and serve as a basis for legislation which then has to live within those confines. PL 92-500 is an example of a needs survey underestimated, and he raises a question which I think is a very legitimate one: are we now overstating it?

QUESTION: Well, George, when I saw the $3 trillion estimate in Newsweek, I was impressed with that. It's hard for me to count that high when you get into the trillions, but obviously, that includes all of the so-called infrastructure.

I think you are right. I think we do not really have a viable replacement strategy either at the local level or in a prescriptive sense, but engineers have that and therefore know how to respond when asked the question what your needs are. Let me point out that we engineers talk about three things: design life; useful life, which in fact has an economic criterion; and, you know, the safety of the system. Now, when one talks about the design life of something, whether it be an automobile, a bridge, or a dam, that is really a prediction of the future in terms of its viability, and it's partly used to rationalize the investment.

I'm not sure there is a detailed way you could get a consensus from a group of people on the lifetime of an object that is either being designed or already existing. I'm not sure you could get a genuine consensus from a group of experts. Part of my statement here is if you are going to rely on certainty, it is putting too much of a demand on the technocrat, if you will, to produce a certain statement in a very fuzzy world. And I don't think you can get certainty, and I know you're not asking for that in black and white terms, but I think you can improve the estimates. I think you raised a legitimate question of what the criteria are for talking about replacement and what viable replacement strategies are.

MR. PETERSON: I wonder if we haven't diverted from the topic of what we were here for. The steering committee, I believe, decided that there was a total infrastructure problem and that one of the ways to reduce that problem was through cooperation, and then asked what the barriers to cooperation are. I don't think we ever concluded that the underground pipe problem is one to be resolved by cooperation. It's a problem, but it was outside the room. That's one of the reasons we didn't talk about it. We were saying that in the area of cooperation you can reduce costs. I think it has been shown, as you mentioned, that in major facilities cooperation and imagination can reduce cost.

Dan brought up the problem of health standards in the smaller system, and the answer to that is obviously, cooperation. I am suggesting that we might want to get back on to what we have learned can be done through the area of cooperation.

COMMENTS BY DR. MARKS

May I remind you that the National Academy of Sciences does not do all things for all people. Clearly involved in this problem are many professional organizations, many public organizations, and the whole governmental structure that is looking at different pieces and parts of this problem. The specific question we would like to ask now is, How might a group like the National Academy of Sciences/National Research Council, which can bring together good professional expertise to address specific issues, assist the urban water management community in the future?

The answer to this question might be negative, and we are willing to accept that. However, if the answer is positive, we must be specific enough to show that it is something that transcends the individual interests of organizations and otherwise is important enough to be addressed because it is needed, and yet we fear that others will not address it.

I won't take a vote until after we get all of the rebels out of the room. We originally started this, as Bob suggested, with some measure of cooperation. We sensed this problem of small utilities not being able to provide the quantity and quality of water needed because of rising costs and numerous federal regulations. We sensed this problem of decaying infrastructure, so we came back to this issue of barriers to cooperation. The question we would like to raise is in what ways there might be cooperation and the sharing of knowledge in financing, in getting ready for this large upgrading of tasks we saw necessary, and where we saw the burden falling more heavily on certain parts of the water segments than on others, on the smaller rather than the larger, on the older rather than the newer.

Now, don't accuse me of setting things up, but I have invited Robert McGarry to present to us a lightning rod on this as a way of starting to answer this question, and he is going to show you how he gets cooperation from his groups.

COMMENTS BY MR. McGARRY

It occurred to me that if we are talking about cooperation, it really breaks down into three different categories: very small utilities, then small to medium ones, and then the large ones. I will throw this out as a set of conclusions.

For very small utilities, I think it is an obvious conclusion that they should cooperate, and maybe that should be spelled m-e-r-g-e, for water quality reasons. There is a strong feeling that they can comply with the Safe Drinking Water Act if they stay real small.

The second point on that problem is, it occurs to me that it will take leadership plus some prodding by a benevolent use of enforcement to achieve this. I believe that the states are the logical level of government to cause this cooperation. I suggest that the Washington State Legislation Program we talked about yesterday is a superior recognition of the problem and a way to deal with it, and it could serve as a model for the country.

In the case of the small and the medium, I concluded that compliance with the state drinking water standards is not the motivation to cooperate. Inadequate supply or cost savings are the motivating forces. I have also concluded that if they do not cooperate, it is not a serious problem. It is a self-inflicted wound, but it will occur when the conditions are right, say, a shortage or increasing cost, and if the leadership is there. If it is not, it will not.

On the very large utilities, it seems that the barriers to cooperation are very political, very complex, probably very well known, and probably very old, and that a resolution takes leadership, willpower, and maybe some money. In those cases, they will be resolved if the conditions and leadership are right and will not be resolved if they are not. Maybe crisis is the thing that brings them right, but I really doubt that there is anything, any research or other National Academy of Sciences activity, that will cause that in the larger ones. They are so political and so complex that they are outside the room.

With that in mind, what is the future role? I would just like to point out two things. Perhaps some good work that would clearly show the health risk to the very small utilities would be a very helpful motivator to causing the cooperation to take place. I think these very small systems are well systems predominantly. What is the risk to them? Maybe go out and look at it and say, Hey, you've got a hell of a risk. The kind of research that I referred to might be a guide for a state to go out and analyze the risks of the small utilities or a specific health risk assessment of a number of typical existing very small utilities to bring the problem up.

On the basis of some discussion yesterday, a further role for the National Academy of Sciences might be in the area of risk analysis. I was a little disappointed that the concept of acceptance or nonacceptance or knowledge of the whole area of risk analysis by water utility managers is lacking. For example, we use the term "safe yield." I have heard it several times. What is safe yield? I challenge some of the people who used it to say they knew what they meant. It is a probability. It is a risk. There is no such thing as a safe yield. But I do suggest risk analysis. Of course, my feeling is that the risk analysis concept not only in water supplies but in other areas should be made more use of. What risk do we take of a bus breaking down? What risk do you take of potholes forming?

DR. MARKS: I hear two things. I hear you think there is a role for the Academy.

MR. McGARRY: My conclusion is, as far as the cooperation issue is concerned, that the biggest field is in the small utilities, and I would say that one thing we might do is generate some data. What are the health risks in the small utility that will be an additional motivator to cause better, more rapid cooperation, or a merger?

DR. MARKS: You would eliminate the small to medium.

MR. McGARRY: I said very small.

DR. MARKS: Small, medium, and the economic.

MR. McGARRY: The small to medium. Again, I suggest, what if they don't cooperate? What is the problem? It will cost them more. Or they are not going to have enough. But I don't think there is research to do. That is politics. But I think in the area of the small ones, the very small ones, there is what appears to be a health risk if we don't do something about eliminating the 4,000 Washington state water systems, etc. We need to push that along, and maybe a health risk analysis will help push it.

QUESTION: Can I ask a question first? By risk analysis, you are not talking just about the safe yield risk analysis; you are talking about security of operation and the whole thing?

MR. McGARRY: Right, the whole thing. It is a separate subject that I don't think we utility managers know enough about and use enough, and I think it should be a part of decision making.

GENERAL DISCUSSION

DR. MARKS: I now throw open the floor to my usually talkative audience and restate the question. Is there a set of activities that the Academy should be involved in, and if there is, would you choose the same set that Bob has identified for us?

QUESTION: Bob, I would disagree that you start with the small systems. I recognize what you are saying, that maybe there should be a model that could be investigated, such as a state law to help deal with that, but my view of the political reality of dealing with my definition of the very small systems is that it is not the place I would really want to start.

Further, I think that it is contrary to what we got up there in that title, because I don't consider the very small systems as urban. Also I think if you start with the small systems you have opened yourself to the other issue we will face sooner or later. What do we do with everyone on private wells? I haven't any way of figuring that out. Therefore, I am very uncomfortable, but I would like to go back to the basic question. Is there a role for the Academy in the area of, and I am going to keep in the words "cooperation in" urban water management, just as you have it.

I have heard several people say that we only hear the horror stories. We never hear the good stories. And it seems to me that some very constructive things are happening in urban water management. I have heard some stories with regard to pretreatment, for example, and how utilities are handling it. This is going to be a big battle whether or not utilities should handle it and whether or not they do a good job if tney handle it. Also, is there public confidence that the utilities will protect their systems by adequate pretreatment programs? But I don't have any good evidence on how it is handled.

QUESTION: Dave, looking at your question, is there a role for the Academy? I think the Academy has a special place in our whole society, and what it should do is what it only can do, and what other people cannot do, so it is by default. And the first one, the small systems, I don't quite see this as an Academy role. It is a good thing to do; however, I don't quite know why the Academy would get involved. I thought the Academy, at least by its legislation or such, was supposed to give advice to the government, and somehow this seems so remote from this. I don't quite link up the Academy with that one.

The second one on McGarry's list seems to me a good research topic, and I would expect that some of the academics in the community might just submit a proposal to us on this kind of thing. Risk and probabilistic analysis are good research topics. Probability applied to structures is all the rage, the steel being up to strength, the load being right, and the structure working. They are all interrelated, and it is a complicated problem. A probabilistic look at the parameters is a very interesting problem, too, but once again, I don't see the Academy being the vehicle for this. So they are good questions, but my problem is, What do they have to do with the Academy?

DR. MARKS: Would you suggest, in fact, that there is no role for the Academy, or have we yet to put our finger on it?

QUESTION: I haven't seen one yet. I am not saying that, but let's keep working on it.

DR. MARKS: Certainly. My response to Merilyn's questions would be to ask representatives of American Water Works Association, in fact, what their role is in presenting success stories.

QUESTION: All you have to do is index the American Water Works Association Journal and it answers your question. There is an immense amount of information. It may not be organized by topic in a way in which you could easily get the answers to your questions. It would take some work. But it is all there, including things such as, Do you operate with emergency crews on the weekend? and so forth and so on, in great detail. The problem is relating that information to the questions.

DR. MARKS: But isn't that a proper question to ask of American Water Works Association, why they haven't thought of reorganizing that information for a different audience?

QUESTION: It may be. One thing I would like to add to the list--and it is not related to cooperation, but it may involve an American Water Works Association or possibly a NAS role--is this question of providing a reasonable approach to escalating replacement. A lot of articles have been written about it. A lot of utilities have different practices and a large number of criteria are involved. Perhaps there could be some greater effort in this area so that people use a generalized or standardized approach to consider the costs and benefits with replacement.

QUESTION: It seems to me that the Academy should be able to give us some help on surface water supplies and groundwater in order to give us some idea of what is going to happen in the future. We contracted to have a system developed that will tell us six months in advance when there will be a decrease in runoff. We are talking about yield reservoirs, and we backed the system up. We tried the system, and it is for Kansas, but the same kind of things, it seems to me, could be used in the Delaware basin or elsewhere.

We backed this up, and it would have alerted us from four to six months before every drought occurred between the late 1880s, which were the earliest records in Kansas. We had the hottest, driest, most intense short drought in 1980 that we had ever had. It alerted us five months before that that would happen. I am not saying it is perfect, but it has given us a tool so that we are able to tell waterworks managers in Kansas that operate a couple of hundred systems that depend upon reservoirs what they can expect statistically in the months ahead. We do it on a month to month basis. It seems to me that that kind of information would be quite helpful to these fellows who don't really worry about what is going on in the reservoir until it gets a quarter of the way down and then wonder what to do from there.

QUESTION: When we are dealing with poisons around the country, most areas have a poison control center where if your child or anyone has swallowed something, you can call them quickly and get a fairly straightforward answer. I wonder about the new organics and all of these sophisticated pollutants that are coming out and will continue to come out for generations to come. I think the Academy could have a role in that, following on what Dr. Metzler said. Do research on the health significance of these, but serve as a hotline for any of us and anyone in the country as to toxic and health effects and when you have an incident or you are just dealing with it in your planning.

QUESTION: Returning to the risk analysis question, there may be a role for the Academy not within water management alone. It seems to me that the social use of risk analysis and infrastructure management generally is very similar between the kind of analysis appropriate for bridges, buildings, and underground transit systems and water distribution systems. It is true, the basic resources can be left to individuals in the National Science Foundation or elsewhere, but there may be a role for the Academy in drawing together from the Transportation Research Board, from water management, and from the board on buildings the general question of using risk analysis effectively for the management of capital structures, and I think it is hard to answer the question of whether it would ever be tied to federal policy or not, but if there is a role for the federal government at all, it would be in terms of management.

MR. PARKER: There is something developing with House Bill H.R. 6159 as follows: "The National Science Foundation on the basis of work done by the National Academy of Sciences and other individuals and institutions both inside and outside the federal government shall recommend to the director"--this is the director of OSTP--"a program of research directed at strengthening the basic and applied sciences required to support federal agencies utilizing risk analysis methods in regulatory decision making."

DR. MARKS: That is coming, I hope. Since the topic here is cooperation, and I warned that we would get back to Warren, have you some comments to add to us on the institutional aspects of cooperation and whether the Academy fills a void there that isn't felt elsewhere?

QUESTION: This grows out of yesterday's discussion and this morning's. Two things. First, the Academy might perform a role in looking closely at what we now do in urban water management, which is largely a matter of compiling and looking clearly. I made some point yesterday of trying to look clearly at what we are doing. A lot of information is available. Secondly, why do we do it? What are the real values that underlie what we do in urban water management?

Now, a couple of preliminary comments. First, I am an optimist. I think things are pretty good. I don't think we are having any great problems. I think we are doing very well, and I think we will finance the water systems we need, and we will be all right. My favorite story is: the optimist says, "This is the best of all possible worlds," and the pessimist agrees.

The starting point was something we had discussion on yesterday afternoon, and I have learned a great deal since I have been here, thanks to all of our excellent speakers, and that is, first, water managers are involved in social policy which is inescapable. In the 1950s, extending into the 1960s, we had a period in which we tried to discriminate between bricks and mortar and human services. Bricks and mortar were supposed to be secondary. That is a false, artificial division. Everything we do is for people. And what we do in water affects the lives of people.

Now, what we do at a particular time in government is a result of interplay, to go back to the basics of technology, values, and individual behavior, as Rachel Carson wrote in The Silent Spring. As we get additional knowledge from research, our values change. There is no role for state or federal financing if we operate on the utility basis. Right? We are in social policy. To explore the underlying values that in fact have led us where we are and to say something about what those values are and how they might be changed, either where decisions are made or who pays, seems to me to be something the Academy might shed light on.

QUESTION: I would like to speak in support of Mr. McGarry's suggestions, perhaps broadening them some. It strikes me that the question was cooperation in urban water management thinking for municipalities or cities as small as 98 and whether we can still call them urban. Those questions are where we feel the greatest concern lies.

When I talk about cooperation, it seems to me that part of the role of the Academy is to take the question that Mr. McGarry has put down and have the Academy look at the cooperation at all levels of government now as they affect those questions and advise the government what changes in cooperation between federal agencies involving state and local governments could improve some of these problems that the conference has outlined.

DR. MARKS: If I understand you correctly, you are talking about the role of various levels of government in encouraging cooperation.

QUESTION: Yes. Example: the U.S. Geological Survey and EPA are both involved in looking at some of the risk analysis for small systems. It's not clear how well coordinated they are. I understand the Corps contracts with both EPA and U.S. Geological Survey. It seems to me a valuable role for the Academy would be to look at what is being done to find out where the gaps are and to advise the federal government where improvements could be made. I don't think it should stop at the federal level but should also go to the state and the local level.

QUESTION: I guess the thing that creeps out to me on these discussions is that we have a rather inefficient management system for water supply systems. I say inefficient but obviously it works. Obviously there are many good examples within that system. But it's extremely difficult to make good decisions a lot of times because of the way the system is established. There isn't a unit of government that meshes with the jurisdiction of all of the water districts. It becomes very confused.

We talk about interstate contact agencies being needed to arbitrate between states, and I don't know what the precise answer is as to where the Academy should be involved. But it seems that we have to look at how that system can be made more efficient. Regionalization is one possibility we have discussed.

There may be other criteria one could use to improve the efficiency of water management. You have companies competing in the marketplace, for instance. You have companies that steal customers away from other companies. There are all types of intrigue going on in the water management business that are very interesting but sometimes make the system of managing the overall system for the public good very inefficient.

QUESTION: One of the characteristics of the Academy is that it gets a lot of free talent brought together of diverse kinds to work on problems, and to a large extent it maintains considerable credibility because it isn't associated and generally isn't perceived to be associated with any particular constituency. It is supposed to be working for the national good.

So in examining what the Academy might do, I would ask those people here who perceive some role for the Academy where a statement, or a report that would result from a consensus of disparate membership would be influential in dealing with legislators or with policy makers at local, state, and even national levels. If the American Water Works Association says something, they are perceived as being really a lobby for the trade, for the water industry. If the League of Cities says something, there is a very strong constituency for the cities that have special interests.

It may very well be that a reasonable statement by the Academy that represents the water industry, that represents the city and state governments and counties and industry, can come out with something that is useful for policy makers, legislators, and so on. And I would ask those who are facing that kind of problem with legislation to consider where this kind of consensus from a credible organization would be helpful.

QUESTION: Speaking on the very small utilities, I think it is a matter of geography in one respect, and the problems are relative in the Midwest where we have all kinds of small cities. By law, a town with a population of 100 is a city in our state, and they consider themselves urban. But an organization that has been in our state for a number of years is the Department of Health and Environment. They hold a benevolent dictator's hand over the small utilities and keep them in line. There are some horror stories regarding the quality of the water they put out and so forth. But the state has done a good job of correcting that. I can't see exactly what the role of the Academy would be. It probably ought to be a state problem for the real small utilities. I think some of these small towns become immune, something like Montezuma's disease, to the quality of the water.

DR. MARKS: I think if you look at this topic of the roles of various governments, what you are basically saying is that the state should be doing something here. It's not clear that all states are uniformly doing this, and that might well be a role for the Academy.

QUESTION: One way where this reasonable statement from a nonbiased group might be helpful now is on this question of the infrastructure of water systems. It seems to me that the stories we have heard are the exception rather than the rule, and we seem to have an overstatement of the problem. The Academy could put that into perspective possibly with a statement. Also you could demonstrate what a 10 percent rate increase would do in those cities that have such a problem if 100 percent of that 10 percent were devoted to a gradual planned maintenance and replacement program. It is not a quick fix problem. It doesn't need to be fixed today. But 10 percent of a system's revenue would fix probably any systems problem over the life of the problem. But putting that into perspective, since it is a matter of serious public concern, might be a role for an Academy statement.

QUESTION: I think the Academy ought to develop an approach to determining replacement of infrastructure needs more than making an assessment of the actual needs--some credible method of determining what people might agree on--and might even be able to incorporate some variation.

One is in that area, and the other two are in the area of risk, first relating to quality risks, Dwight's concern, and the idea of conveying the Academy's responsibilities under the Safe Drinking Water Act. In this category some rational approach, some understandable public approach to understanding what quality risks are may be a role for the Academy. On the other side of the coin is a rational approach to looking at quantity risk in the McGarry example and those of other people in the room trying to come to grips with that.

QUESTION: A reasonable approach to estimating the costs and benefits of replacing old water systems, how do you do that, what are some reasonable criteria--not just going in and saying everything over 50 years is out. A lot of work has been done in that area. If it were brought together and evaluated, it would be helpful. The other two are in the area of risk analysis--one quality, the other quantity.

QUESTION: On the question of risk analysis for quality, the Academy has a very active committee already working on this on a continuing basis, and that falls in a different bureaucratic portion of the National Research Council than that which we are being sponsored by. They were responsible for the first report, "Drinking Water and Health," and now there have been four that have emanated from them. This is an ongoing committee. In fact, they very well perceive the risk nature of the determinations that have to be made. They first came into the business because EPA had requested a standard. The Academy was to present the standard, and of course they were very unhappy when the Academy would not come up with numbers and came up with the idea of risk.

In the case of the water risks, this may be something that is more appropriate, particularly if one can perceive that if you have two communities--one with a high risk because of the nature of its resources and another with a lower risk--the advantages that would accrue from combining this would lower the risk for both at no great additional cost. This would be one of the bases for encouraging some kind of cooperation.

But I would like to make one specific comment that seems to emanate from a lot of the conversations here that is not outside the Academy's role. We are looking forward to a period when there will be less and less federal support for our activities, and the Academy might perform a very useful service by helping the states, cities, and federal government to point to that post PL 92-500 grant program error. Now, the National Water Commission, when Ted Schad was its executive director, did make a recommendation for the orderly phasing out of the construction grant program, and that has been what has been sorely needed. We now have $2.4 billion. What will happen next year? There is nothing orderly about it. Will it be a slow withdrawal, or will it be cold turkey?

QUESTION: But I think in this area the National Academy of Engineering did hold some roundtables on PL 92-500, and this would be a very useful extension of that because the governors and all of the city officials have to begin to prepare for the time when they will have to do everything themselves. The British experience is valuable because they have been in that now for 10 years where they have to finance all of their activities by charging those who benefit from the service.

QUESTION: I want to have a comment from the state perspective of where the Academy can be of the most help. I see the most help helping us in the biggest political battle, and I see that as the management of the overall water system problem.

There's something wrong when a state has to spend the majority of its time on a dinky water company. This is the forest for the trees, if you know what I mean? Going into the merger business and enforcing takeovers and getting into that whole institutional dilemma, if you are going to have any success you have to have a lot of people pumping behind you. That's what Bob was talking about when we put it up on the board, about taking off an end piece of it that we know is the real problem, the real tiny guy, and trying to do something with that. I do think that we need the force of some clear thinking on how we get over that hump into a better system of management.

QUESTION: According to my perspective from being involved in American Water Works Association and also at EPA with the National Drinking Water Advisory Council, two of the major problems are (1) the small systems and how you deal with them, how you handle them--nationally, statewide, whatever, and (2) lack of a clear definition of health effects research and what is going on and getting some hard data out there and getting them looked at. Both organizations have those problems, and I see those as being clearly areas in which by statute the Academy should be involved, and I think more needs to be done.

CLOSING REMARKS BY DR. MARKS

I want to thank you all. We have reached the closing moment. I want to thank you all on behalf of the Academy.

If I can have some reflections here, let us not be lulled into self-satisfaction over what has gone on here. It has been a very informative meeting, but I would suggest that people in this meeting are not a cross section of the American water industry. The ideas that have flashed back and forth I think have helped all of us. It is still a question of how that translates to the bulk of the people. I think it has been a very good meeting, but as I suggested to Merilyn this morning, I don't know if we are talking with ourselves or we're just smart because we're all here discussing the problems.

But I think there is still a large gap between what a small group of experts such as we can come up with and what in fact a professional who doesn't know and wants to know can do. I would like to thank you all on behalf of the Academy. We'll keep you posted on where we go from here. A report of this meeting will eventually be sent to the sponsoring agencies and to the conference participants. I want to thank you very much. It has been a very, very exciting time for me.

SUMMARY

COOPERATION IN URBAN WATER MANAGEMENT

The theme of this conference has been "Cooperation in Urban Water Management." Clearly, such a title makes an implicit statement about a mechanism for solution as well as the nature of the problem. However, as with all complex problems of public policy for vital resources, the most critical aspect of moving from where we are to where we would like to be is careful definition of the problem. Essential questions are: Who are the managers in the broadest sense, what are the indicators that reveal disfunction, what are the alternatives, what are the evaluation criteria that define an effective solution, and what are the barriers to implementation?

Urban water resource management as an important public activity requires large investment in technology to bring water from where it is found to where it is needed in the quantity and quality desired. This would also include treating the water before returning it to the environment. As a public activity, responsibilities for planning and addressing important questions about investment priorities, who decides about present and future strategies, and most importantly, fiscal responsibilities become quasi-governmental functions to be carried out in competition with other important public responsibilities. To do this, institutions are formed to finance and manage water activities, governmental agencies establish criteria and procedures to regulate these activities in the public interest, and a cadre of professionals are trained and organized to carry out all the functions necessary to make this happen. Surprisingly, over the past decades, water supply and waste disposal activities at the local level have been carried out with relatively few problems and little attention for a resource so vital to the metabolism of our society. Thus, an important first step in problem definition is simply to focus on factors that have changed. What makes the provision of safe water in adequate quantities and qualities and treatment of water after use in the near future more difficult and expensive than it is now?

Several symptoms have led us to believe that there is a problem. Such symptoms include a concern for aging supply and distribution systems that have not been properly maintained and upgraded, the interjection of new types of chemical threats into the environment due to advances in other technologic areas, increasing evidence that elements present in new and existing water supplies in trace amounts may have long-term health effects, and periodic urban drought in which public convenience is impaired and commerce disrupted. The difficulty present system management has is responding to new organizational needs and government regulation. As evidence of these symptoms occurs throughout the country, we find that the institutions and strategies of the past and present seem inadequate. The solutions will require large financial investments as well as institutional change. At present, insufficient money is procured to meet these demands, and there is a perceived inability on the part of the water utility manager to raise the funds necessary to avert these problems. The situation is aggravated in smaller communities that do not have the management and technical personnel to address these problems.

Solutions point toward cooperation at a higher level between local entities (i.e., regionalization) to better share resources and costs. However, such regionalization will require the establishment of new institutions as well as new and innovative cooperative agreement procedures among existing agencies and for equitable operation. Such new organizations are not formed without some local interest groups being hurt in the process and without strong, insightful leadership and dedication. Problems of new technologic strategies require a profession that understands new options, communicates well about what technology is effective, carries out research toward better solutions, and is capable of educating a less technical public about the advantages and disadvantages of proposed alternatives. The fact that this conference has occurred indicates that most of these activities are not taking place at the level needed for our changing needs.

Where will the money, technical expertise, political leadership, and institutional reform come from to provide and implement effective answers to these problems? What follows is a consensus of findings derived from the conference discussions.

THE PROBLEM OF AGING INFRASTRUCTURE

Several themes emerged during the conference discussions about infrastructure. First, the problem may not be of the magnitude being described in the media and in recent overview reports. Many of these estimates are derived from the assumption that everything old needs to be replaced with costs estimated by the present cost of replacement. This is not the case. Many old systems need only continued maintenance and rehabilitation, not replacement. Even for those in bad condition, the best strategy may well be to consider new and more cost-effective ways of providing service with the existing infrastructure. Interestingly enough, the utility managers at the conference did not feel that the problem was totally technical. They felt a critical element was to find ways to raise the money necessary to carry it out.

There was extensive discussion of "creative financing"--innovative ways to raise money in these times. This led to discussions of privatization, a process by which the private sector, armed with the hidden subsidy of tax incentives, could provide public infrastructure at lower cost. The concept of infrastructure banks that could serve as sources of large amounts of revolving capital at low interest cost for both public and private sector infrastructure development as recently considered in several states also was presented. All felt that the best governmental approach to the problem was largely local and regional with the states responsible for enforcement and regulation and the federal government providing the research necessary to bring about new and better solutions. There was little sentiment for a massive infusion of federal funds for the problem in the same way that wastewater treatment problems were approached under PL 92-500 (Federal Water Pollution Control Act Amendments, 1972). The massive red tape, long delays, rigidity in approach, and uncertainty in long-term policy that characterized that program are not something anyone wanted to see recreated for water supply. That is not to say that a massive infusion of "no strings" money that could be spent with relative local autonomy and control would not be happily accepted. However, given the current political times, the chances of such an occurrence were considered so small as not being worthy of further consideration.

Research topics that require careful consideration are the following:

A. Mechanisms for creative financing
B. A better definition of infrastructure needs based on a more realistic view of alternatives

THE REGIONALIZATION AND COOPERATION PROBLEM

One possible way to reduce per capita expense and provide a wider range of higher-quality options and alternatives in water supply is to look at increased cooperation. For very small facilities, this could mean sharing trained people, labs, or other services. For larger organizations, particularly those near each other in urban/suburban areas, a physical integration of sources, transmission, and treatment could provide the economies of scale that would reduce costs. It comes as some surprise that such regional organizations are not evolving more rapidly. Clearly, when the obvious is not occurring, perhaps something not so obvious is taking place. Regionalization definitely does have perceived drawbacks as well as benefits

On the structural level, while economies of scale in treatment and supply facilities may be gained, transmission costs for a larger network tend to reduce these savings. At the institutional level, many more problems occur. Local officials fear their loss of control and even loss of one of the few municipal enterprises that can be self supporting enough to yield funds for other urban services. As governing organizations become larger, individuals have a smaller voice in their overall governance. Consulting engineers may not generally support regionalization because of the possible loss of clients.

Research Needs

A. If regionalization is a possible answer, then research into how regional institutions are best set up to minimize drawbacks and effectively manage resources is sorely needed. Perhaps an impact statement or case studies to show what happens when smaller organizations join a larger one would help.

B. Continued research into the strategies for devising and analyzing management schemes for regional systems as noted in the next sections is sorely needed.

NEW APPROACHES TO MANAGEMENT: TECHNICAL AND ORGANIZATIONAL

At the root of proper management is a clear understanding of all the elements of the system and alternatives available. Are these being pursued with enough vigor in the water industry? We think not. Most system managers at the conference felt that enough was known about the technologies of repair, maintenance, and rehabilitation, but that there were not enough external incentives to introduce these technologies everywhere.

The nonutility participants expressed considerable skepticism about this. Are there new materials and methods not yet tested? If there is sufficient technical information, is it being properly transferred and distributed? Information is a critical element of management, yet few systems are set up with adequate means for recognizing problems early. Most financial information is collected for accounting purposes and is of very little use to system managers because of its form and lack of timeliness. There is no system of uniform accounts so that data between systems can be compared for trends or used to help guide other activities. An important option for increasing system capabilities is to bring about demand modification. Everyone seems to like this except the water professional because of the problems demand modification causes for the system and the individual user.

In this case, response to demand modification is not easy to predict or to capture when needed. Supply alternatives "cast in concrete" are always there when needed. Demand modification depends on people modifying their behavior and living standard as well as making individual investments in water-saving technology. What happens if resolve vanishes in an emergency? Demand modification can bring side problems such as ruined lawns, commercial interruption, and general inconvenience that cannot be easily measured in units commensurate with the cost of supply enhancement.

A final concern is risk analysis. There are many elements of uncertainty in water supply planning, such as reliability of supply, magnitude and timing of demands, and the availability of the system. Some activities are more risk tolerant than others. How are risks and cost risk trade-offs better quantified and presented?

Research Questions of Interest

A. What alternatives are most effective in modifying demand? What is the role of price level and structure? How can the system management predict short-run and long-run response to conservation initiatives?

B. What are possible strategies, especially in materials selection, for repair, maintenance, and rehabilitation decisions? Can we predict which pipes are most likely to break, and if broken, which would be most critical? Can we schedule preventive maintenance activities accordingly?

C. Information for the operating managers that is also compatible between systems is essential. How can computers and concepts of data base management and decision support systems be better incorporated into decision making?

D. How are regional systems expanded considering the uncertainty about future supplies and demands? How are costs allocated to participants?

SUGGESTIONS FOR THE WATER PROFESSIONAL

Water professionals are by nature extremely conservative. They feel they are successful if there are no complaints and if enough reserve supply is available. The fact that this risk averse behavior favors more costly supply alternatives over demand modifications needs more careful consideration. The profession has been noticeably remiss in supporting research (particularly socioeconomic) or in valuing new ideas. The modest amount of funds that have been generated are most often put toward support for technology, including technology transfer, rather than for new research.

Since little attention has been paid in the past to a service that seems in good shape, arguments for greater expenditures for maintenance, management information systems, or other essentials to good control are either not made or routinely brushed aside. The profession also does not always have a very good rapport with its clients. The message from the professionals and their societies seems to be, "If they just left us alone, we could get on with our job." This begs the questions of the importance of understanding the needs for society, not only for water but in competition with other services. The wave of public involvement in public decision making is long established and legitimized. The profession must learn how to communicate with such a process if it hopes to do its job well.

New concepts in technology, computers, economics, and management mean that training of existing personnel must be upgraded and curricula for future professionals improved. No such move seems apparent. Does this back-burner and low-technology attitude mean difficulty not only in getting the public's attention now but also in attracting qualified people in the future?

PUBLIC DECISION-MAKING PROCESSES

The preceding section may seem overly critical of the water professional. In the vacuum that has developed over how decisions are made, the public often perceives that the water professional bears the brunt of major societal impacting decisions. This should not be the case, as local government must provide for its part of the bargain as well. How many systems are in disrepair today because the political process did not want to raise water prices to cover such activities? How many systems are in disrepair because the political system used accrued monies for other public purposes? Do proposals for more cooperation and contingency planning in case of drought emergency not get adopted because they are technically difficult or because they are politically difficult? We suspect the latter.

Clearly it is the political system that has abdicated its responsibilities and in the process left the water professional on the line to accept the blame. Will providing extra resources for poorly managed systems make them any less susceptible to poor political understanding of the need? Demand modification is a problem with too much social content to be decided on at a technical level alone. Thus, we should be asking how we make our institutions more responsive rather than how professionals have failed. However, the water professional must also learn how to present information about needs in a clearer and stronger way.

The success stories in water management usually have a strong leadership component, i.e., someone with vision and drive who wanted to make something happen. How is such leadership capability identified, formed, and encouraged?

RECOMMENDATIONS FOR A NATIONAL RESEARCH COUNCIL ROLE

A most important aspect of the problem in which the NRC can be active may be in opening channels of communication between the profession and the decision-making process. Decision makers cannot be expected to pay attention or to make proper allocation decisions if professionals are not giving detailed and understandable information.

At a more technical level, there are still many unresolved problems involving management information systems, risk analysis, water conservation, and regionalization. The NRC role here should be to influence the water management profession (and the public) to learn more about these problems and to develop new ideas through research and to disseminate this information.

A report from the NRC might address these questions and advise the government and the profession at large of changes in cooperation between federal agencies and state and local governments that could assist in solving some of the problems that the conference has outlined. Such a report would be influential in dealing with policy makers at local, state, and national levels.